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EDITORIAL.

The Kidney Worm of Pigs. Considerable work was carried out at the Central Experiment Station, Serdang, prior to the war in connexion with the infestation of pigs by the kidney worm (*Stephanurus dentatus*, Deising, 1839). Experiments were made to investigate the popularly held belief of Chinese-pig-breeders that cooked banana stems help to control the pest, and fortunately the records of that investigation have survived the occupation and are published as an article in this issue.

The results of the experiment show that banana stems do not possess any special anthelmintic properties, but they appeared to have a healing effect on internal organs suffering from the earlier effects of the parasites, consequently resulting in a higher percentage of healthy livers and kidneys.

Possibly the most important discovery as a result of the experiment was that infestation by the kidney worm can apparently be eliminated by the careful daily sluicing of concrete-floored styes. The eggs of the parasite are voided in the urine, and, provided concrete-floored styes only are used and sluiced daily, the infestation comes to an end as the kidney worm appears to have a mature existence of only a few months.

Central Experiment Station, Serdang. The article in this number describing conditions on the Department's Central Experiment Station at Serdang during and after enemy occupation is of interest, showing as it does, how very rapidly in the tropics the results of years of careful research work can be lost or vitiated by a period of neglect. Fortunately the damage at Serdang was not beyond repair. During the past 18 months considerable and hard work has been put into the Station, and while the results of much experimental work are irretrievably lost, and a large number of crops have been lost, new experiments are being laid down, the oil palm and tea factories are once again in production, new stocks of planting materials are being raised, and the Station is rapidly recovering from the long period of neglect.

Emergency Food Production. Attention is drawn to the article appearing in this number which recounts the important developments which have now taken place in the direction and organization of emergency food production in the Malayan Union.

Until recently the Department of Agriculture had not been responsible for the development of emergency food production areas, with the exception of wet padi areas, since a separate organization had existed for that purpose under the direction of a Food Executive Committee.

By a directive of His Excellency the Governor this temporary organization has been absorbed into the Department of Agriculture with effect from 1st March, 1947, and the administration of all emergency food production is now the responsibility of the Director of Agriculture.

Prompt steps have been taken to survey all Government Farms which were in process of development, and a Technical Committee, consisting of senior officers of the Department, has already reported the result of their inspection of these farms.

One of the most important changes in policy concerns the use of mechanical equipment. Thorough investigations are being carried out into the possibilities of mechanized cultivation in Malaya before accepting mechanization as a means of large scale food production, and a whole hearted drive to produce padi, wet or dry, in preference to other cereals or root crops is in progress.

Local Tobacco. Javanese small-holders in the Kuala Langat District of Selangor, produce a tobacco prepared for smoking in a wrapper of dried immature leaves of the nipah palm. The crop is cultivated on peat and average yields of prepared " tembakau rachit " of approximately 4 piculs per acre are obtained within three months of planting. In an article, included in this issue, Abdul Hamid bin Haji Hussein, Malay Agricultural Assistant, gives a full account of the methods of cultivation and of the simple manufacturing process adopted by the growers.

Original Articles.

KIDNEY WORM OF PIGS

Effects of Feeding Banana Stems to Infested Pigs

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In a previous article (1) on this parasite of pigs of tropical and sub-tropical countries, it was recorded that " no anthelmintic is known that will eradicate the worms from the kidneys of infested pigs, but that Chinese pig keepers have a firm belief that cooked banana stems have a definite action in checking the ravages of the pest or ameliorating its effects on infested animals." It was further stated that experiments were being made to test this contention at the Central Experiment Station, Serdang.

The experiment mentioned above was commenced in May, 1940, and terminated on December 20th, 1940. It was designed to ascertain whether cooked banana stems in pig rations had any anthelmintic properties or had any ameliorating effects on the viscera, particularly the kidneys and livers, of infested pigs.

If banana stems possessed such properties it could be inferred that a ration containing this ingredient would provide greater live-weight increases when fed to infested pigs than would be obtained by feeding a similar ration but containing no anthelmintic. To test these points live-weight gains were recorded of all pigs under trial.

The State Veterinary Surgeon, Selangor, collaborated in the periodic examination of urine samples and made a report on the post-mortem examination of the carcases and internal organs.

Towards the end of April, 1940, urine samples were collected from twelve pigs in a Chinese piggery, nine of which were voiding eggs of the parasite in the urine. Eight pigs approaching slaughter weight which were positively proved to be infested with the kidney worm were selected and purchased as suitable subjects for the experiments.

Since the maturation period of the parasite within the host is approximately six months, animals under this age could not be voiding eggs of the parasite in the urine; in consequence it was necessary to conduct the experiment on animals approaching maturity.

The pigs on arrival at the Central Experiment Station, Serdang, were divided into two groups of four animals so that the total weights of the four

pigs in each group, A and B, were almost identical, as recorded below in Table I.

Table I.

Weights of Pigs at Commencement of the Experiment.

Group A.

No.	Breed	Sex.	Weight lbs.
281	Large Black ..	Gilt	124
282	Large Black ..	Gilt	152
283	Large Black ..	Gilt	132
288	Middle White X Chinese	Gilt	167
		Total	575

Group B.

284	Large Black ..	Gilt	153
285	Large Black ..	Castrated male (barrow)	149
286	Large Black ..	Castrated male (barrow)	113
287	Large Black X Middle White X Chinese ..	Castrated male (barrow)	159
		Total	574

The grouping, in order to provide equal weights in each lot, separated most of the males from the females.

The two groups of pigs were provided with similar housing accommodation about half a mile from the pig farm. The floors of the pens and the surrounding drains were constructed of concrete.

Precautions were taken to prevent the dissemination of the eggs and larvae of the parasite by directing all drainage from the styes to a concrete sump. The contents of the sump were treated with a 5 per cent. solution of copper sulphate to destroy the parasites therein; after being mixed with lime, all dung and drainings were buried in trenches in an area of land not used for growing pig food. The labourer who attended the animals was provided with a tub of disinfectant to wash his feet following each visit to the pens.

Table II shows the rations fed throughout the period of the experiment.

Table II.

Rations fed during the Experiment.

Group A.		lbs.	*Group B.*		lbs.
Banana stems cooked	..	30	Banana stems	..	nil
Tapioca roots	..	40	Tapioca roots	..	40
Guinea grass	..	5	Guinea grass	..	10
Broken rice	..	2	Broken rice	..	2
Rice polishings	..	7	Rice polishings	..	7
Coconut cake	..	3	Coconut cake	..	3
Groundnut cake	..	2	Groundnut cake	..	4
Fish refuse	..	2	Fish refuse	..	2
Minerals	..	1	Minerals	..	1

The constituents of the rations were calculated to conform closely to standards for animals of the weights recorded at the commencement of the experiment; the albuminoid ratio became a little narrow for the optimum live-weight increases as the animals became heavier. It was considered inadvisable to change the ration for the sake of live-weight gains. Slight variations in some of the ingredients of the rations were necessary to provide, as near as possible, the supply of an equal amount of dry matter, digestible crude protein, fat and nitrogen free extract (carbohydrates). There was a marked difference in live-weight gains in pigs of the two groups which is discussed later.

The reports by the Veterinary Surgeon, Selangor, on the urine tests are given in Table III.

The examination of the urine of the individual pigs before purchase was recorded with only a rough indication of the number of eggs present; actual counts from a specific quantity of urine were not made until the fourth series of samples were examined.

These tables of counts show that there was during the experiment a general diminution in the number of eggs voided in the urine in seven out of eight of the pigs under test, the last record of pig No. 288 in the banana stem group being the exception. This gradual fall in egg numbers occurs in both groups and it would appear, therefore, that the animals received an early infestation, probably when they were allowed to roam about the kampong as suckling or weaner pigs. The daily sluicing of the floors of the styes prevented any further infestation.

The trial was terminated owing to the pigs becoming over weight for sale as porkers.

The four animals in each group were delivered to the abbatoirs on succeeding days to eliminate any possibility of mixing the carcases.

The report of the State Veterinary Officer, Selangor, on the condition of the carcases, the liver and kidneys, of each pig under trial, is given verbatim hereunder.

Table III.

Summary of Reports on Urine Tests by the Veterinary Surgeon, Selangor.

Group A. Banana stems fed in ration.

	No. of eggs in microscopic field.			No. of eggs per 100 ml. of urine.		
Date of test	30.5.40	11.6.40	25.6.40	21.8.40	19.10.40	29.11.40
Pig No. 281 ..	No eggs	Very numerous	Few	0.3	None	3.6
Pig No. 282 ..	A fair number	Numerous	Very few	17.7	4.0	None
Pig No. 283 ..	Very few	Numerous	Numerous	43.3	42.0	7.0
Pig No. 288 ..	Numerous	Innumerable	Innumerable	318.0	44.0	Innumerable

Group B. No banana stems fed in ration.

Pig No. 284 ..	Numerous	Very numerous	Very numerous	55.9	7.0	0.3
Pig No. 285 ..	Fair number	Numerous	Very few	21.6	4.0	None
Pig No. 286 ..	Numerous	Numerous	Very numerous	31.5	3.0	2.3
Pig No. 287 ..	None	None	None	4.6	2.0	2.3

Group A.

" Pig No. A 281.—No parasites were found in the kidneys. In the perirenal fat there were a few old cysts which were empty of parasites. The liver was normal. A quantity of fine calcareous deposit (sand) was found in the urinary bladder.

Pig No. A 282.—The kidneys were cloudy and mottled on the surface but contained no parasites. One male worm was found encysted in the perirenal fat. The liver was pale and cirrhotic but showed neither abscesses nor parasites.

Pig No. A 283.—The kidneys appeared normal. One male and two female kidney worms were collected from two cysts in the perirenal fat. The liver was normal.

Pig No. A 288.—The kidneys were normal in appearance and contained no parasites. From five cysts in the perirenal fat a total of eight male and five female worms were extracted. There were also two cysts which contained no worms. The liver was normal.

Group B.

Pig No. B 284.—Parasites were present in the pelvis of each kidney. There was one abscess in the right kidney and two abscesses in the left kidney. Old cysts but no parasites were found in the perirenal fat. In the liver there were small abscesses.

Pig No. B 285.—The left kidney was free of parasites but worms and abscesses were found in the right kidney. The liver had two abscesses.

Pig No. B 286.—Parasites were found in the pelvis of each kidney, and in each kidney there was one abscess. Livers were normal. No parasites were found in the perirenal fat though there was evidence of old worm cysts.

Pig No. B 287.—Parasites were present in the pelvis of each kidney, and in each kidney there was an abscess. No parasites found in perirenal fat. The liver contained a number of small abscesses."

This report does not disclose any signs of recent infestation through the skin which causes lesions, oedema or enlargement of superficial lymph glands. The diminishing degree of infestation has insufficient influence on the carcases to warrant any adverse comment on their quality.

Worms were not observed in the kidneys of any of the four pigs of A group at the post-mortem examination on 19th December, 1940, yet three weeks earlier three out of four of these animals were voiding eggs in the urine.

These observations show that all animals in the B group had abscesses in the kidneys and three out of four had abscesses in the liver. The pigs in A group had mostly normal livers and kidneys, and abscesses were absent.

The results indicate that there is no specific in banana stems which has any more anthelmintic properties than are contained in the foods of the alternative ration.

Table IV.

Summary of the Report by the Veterinary Surgeon, Selangor

Post-mortem Examinations.

Group A—Banana stems in ration			Group B—No Banana stems in ration		
Pig No.	Liver	Kidney	Pig No.	Liver	Kidney
281 ..	Normal	Parasites absent	284 ..	Abscess	Parasites present with abscesses
282 ..	Pale and cirrhotic	Parasites absent kidneys cloudy and mottled	285 ..	Abscess present	Parasites and abscesses in right kidney
283 ..	Normal	Parasites absent; kidneys normal	286 ..	Normal	Parasites present; abscesses in each kidney
288 ..	Normal	Normal; parasites absent	287 ..	Contained small abscesses	Parasites present; abscesses in each kidney

Although there were indications of a diminishing degree of infestation in both groups of animals, the banana stems would appear to have had a beneficial effect in healing the internal organs of the earlier effects of the parasites.

Comments on the Results of Feeding the Two Rations.

Comparisons of the efficiency of the two rations used are obscured by many influencing factors. Live-weight gains of each pig are recorded in Table V below.

Table V.

Live-weight Gains during the Period of the Experiment.

Group A.

	Wts. on 30.4.40 lbs.	Wts. on 10.12.40 lbs.	Total Gain lbs.	Live-weight gain per day in lbs.
Gilt No. 281	124	248	124	0.556
„ 282	152	285	133	0.596
„ 283	132	267	135	0.605
„ 288	167	302	135	0.605
Total	575	1,102	527	

Group B.

Gilt No. 284	153	328	175	0.785
Male „ 285	149	305	156	0.699
„ „ 286	113	310	197	0.839
„ „ 287	159	304	145	0.650
Total	547	1,247	673	

Figures in Table V show that the pigs in B group, despite the unhealthy condition of their livers and kidneys, put on weight at a much faster rate than the presumably more healthy pigs of A group.

The inclusion of four gilts in A group and three castrated males and one gilt in B group provided this latter pen with an advantage, owing to the tendency of unspayed gilts to lose, for a day or two every three weeks, their appetite during periods of oestrus. The gilt however in group B was the second best feeder of the four pigs.

The albuminoid ratio of the ration fed to the A group was 1 to 6.6 and should have been nearest to standard recommendations for pigs over 120 lbs. in weight, whilst that fed to the B group was 1 to 6.4 and more

suited to pigs approximately 120 lbs. in weight. The inclusion of sweet potato vines and an additional 2 lbs. of groundnut cake to balance the ingredients in B group ration may have provided this pen with proteins of a better quality and generally more suited to pig feeding.

The inference that may be drawn is that the fairly cheap B group ration will produce good live-weight increases when fed to uninfested fatteners of 120 lbs. or more in weight.

Summary.

An experiment was conducted on eight fattening pigs infested with *Stephanurus dentatus*, Deising 1839, the kidney worm, to test the contention of Chinese pig keepers that cooked banana stems in pig rations check the ravages of the pest, or at least ameliorate the effect of the worm on infested pigs.

The experiment confirms, in part, the Chinese pig keepers' belief that cooked banana stems, fed in pig rations, result in a higher percentage of healthy livers and kidneys in the carcases of infested pigs and, in consequence, fewer of these organs are condemned by the Inspector of meat at the abattoirs.

It shows, however, that banana stems possess no more anthelmintic properties for destroying or expelling the parasite from the viscera, than were contained in the alternative ration.

The post mortem examination revealed that the livers and kidneys of the infested pigs, receiving banana stems in the ration, were in a far healthier condition than the same organs in the alternative group fed on a ration containing no banana stems, and suggested also that the parasite had a mature existence of only a few months in the viscera of the host.

Examinations of the urine showed a gradual diminution of the degree of infestation manifested by a steady decline in the number of parasite eggs voided.

As stated in a previous article (1) about six months elapse from the first ingestion of larvae to the excretion of eggs. It will be realized, therefore, that the breeding animals in a herd are most likely to disseminate the parasite. Fatteners, infested when very young under a system of modern rapid feeding, should be approaching slaughter weights when they commence to void eggs.

The experiment indicates that daily sluicing of concrete-floored styes gradually eliminates a moderate degree of infestation of the worm from mature pigs, and suggests that such hygienic methods of maintenance would eventually eradicate the pest from an infested herd.

The rations used were reasonably cheap and were efficient, particularly that containing no banana stems. The pigs made reasonably good live-weight increases despite the fact that they were approaching mature weights and were all infested with the kidney worm.

Acknowledgement.

The writers wish to record their indebtedness to Mr. Rocker, State Veterinary Surgeon, Selangor, for examination and reports on the samples of urine and for the post-mortem reports on the carcases and viscera.

Reference.

1. The Kidney Worm in Pig, *Stephanurus dentatus* (Deising 1839). T. D. Marsh, *Malayan Agricultural Journal*, Vol. XXVIII, 1940.
2. Feeding Trials with Pure-bred Chinese Pigs. T. D. Marsh and N. Kanagaratnam, *Malayan Agricultural Journal*, Vol. XXVI, 1928.

CENTRAL EXPERIMENT STATION, SERDANG.

Conditions During and After Enemy Occupation.

Compiled from information obtained from the Staff of the Station.

Introduction.

Soon after Kuala Lumpur was occupied by the Japanese in January, 1942, the Central Experiment Station was re-opened with a skeleton staff and labour force under the charge of one of the Station Asiatic Officers. The main activities during the early stages of the occupation were the cultivation of vacant areas for the planting of foodcrops and fodders, with the control of undergrowth and weeding of permanent crop areas. No palm oil, tea or coffee were produced owing to the factories having been put out of commission by the European Officers before evacuation, in accordance with the scorched earth policy. In July a Danish planter took charge of the Station, but towards the end of 1942 he was superseded by two Japanese. From this period onwards the Station was run according to Japanese methods. Changes in the Japanese personnel were frequent, and as each had different ideas and policy the working conditions became intolerable. However, the work of foodcrop cultivation proceeded sporadically until about the latter part of 1944 when the food situation became more acute, the health of the labourers was badly affected, and the Japanese personnel were harassed by guerillas. Conditions afterwards fast deteriorated until finally, from the early part of 1945 until the liberation, work was almost at a stand-still.

Conditions During Enemy Occupation.

Established pre-war experiments were not continued by the Japanese, although the relative records were left in the office and some were recovered on re-occupation. The Japanese, however, did inaugurate some experiments and trials along their own lines of thought, mainly in connexion with foodcrops and fibres. They kept their own records in their own language, and these have not been discovered.

The main policy during the occupation was to increase food supplies; all other work was subordinated to this purpose and in general the permanent crops were neglected. Until the machinery was repaired late in 1942 harvesting of the oil palm fruit bunches and tea plucking were not undertaken. Later, all the tall oil palms were abandoned and little harvesting of the crop took place. The small amount of oil produced was supplied to the labourers and staff for edible and lighting purposes, while the balance was sent to Headquarters for soap production and axle-grease manufacture. Only two tea fields were properly pruned, the other being roughly slashed, and the tea areas were not manured. Later, plucking and manufacture were contracted to a Chinese, who produced mainly China tea; only a small quantity of black tea was made. In order to obtain high returns, very heavy plucking was adopted without any consideration for the welfare of the bushes.

Other permanent crops were completely abandoned except where the produce was required for local use, such as rope and twine from the manila hemp, *Musa textilis*, and coffee, *Coffea robusta* and *C. liberica* for local consumption. The areas of *Derris elliptica* were removed to make way for foodcrop cultivation; similarly with new pastures and fodder demonstration plots. For unknown reasons, the selected derris clones in the nursery area were left untouched, although a Japanese planting company in Sungei Buloh purchased most of the material from other parts of the plantation for planting purposes.

Fruit areas were completely neglected. The large stock of budded plants which was prepared for distribution in 1942 was sold or disposed of as free gifts to Japanese visitors.

The General Nursery was used for the cultivation of vegetables and the production of seed. Attempts to introduce vegetables and other crops by the use of seed imported from Japan invariably met with failure. It is unfortunate that a large number of minor economic crops growing in the nurseries were destroyed. (*vide* list in Appendix I).

Towards the end of 1944 the Japanese launched a scheme to improve the food situation by allotting about 75 acres of reserve jungle land in the north-eastern end of the Station to the Chairman of the Overseas Chinese Association, Serdang. The area was to be divided into 1-acre blocks for planting foodcrops, and to be alienated to needy Chinese in Serdang. The terms of the contract were that a certain percentage of the crop should be delivered to the Station office, and all felled timber was to be supplied to the Station for building material or fuel. One crop of tapioca, *Manihot utilissima*, was planted, but before it could be harvested, the Japanese capitulated.

Condition of the Station on the Arrival of the British Military Administration. September, 1945.

On entering the Station the appearance was one of neglect and destruction. The oil palm avenues were obstructed by unpruned leaves, which hung down into the road. These leaves were hacked out of the way by a soldier sitting on top of the leading truck of the re-occupying British troops. The road verges were overgrown with lalang, (*Imperata cylindrica*), and sendudok or Straits Rhododendron (*Melastoma malabathricum*) bushes abounded, covering most of the drains.

In the more open and less shaded areas lalang, sendudok, (occurring in large areas often 6 to 12 ft. high) and the sensitive weed, (*Mimosa pudica*) were predominant.

The drainage system had been allowed to deteriorate, and flooding was severe in the low-lying areas. Some of this flooding was aggravated by the damming of some of the larger drains to form fish ponds.

When clearing the drains, the original line was most easily determined by following the more luxuriant growth of sendudok, which growing from the bottom and sides of the old drains overtopped the surrounding secondary jungle growth. Perhaps this was due to the more fertile soil within the drains which, owing to earlier neglect, were silted up with the eroded top soil from areas at a higher level.

The tea areas were badly neglected, although some sporadic work had been done on some of the fields. Surprisingly healthy tea was found under luxuriant secondary jungle growths. The healthiest and the more numerous survivors were found where the shade trees had survived, and this was particularly so under the *Gliricidia maculata* shade. Ganoderma root disease of tea bushes appeared to have spread in annular areas from dead and presumably diseased *Albizzia moluccana* shade trees. It was noticeable in Field 16 that the healthiest tea bushes were towards the top of the slope, although the area was completely over-grown with weeds. It was thought that this might be due to the better drainage at the higher levels of the Field.

The oil palm areas were neglected and were covered with a heavy undergrowth of sendudok, and climbing ferns. The young palms in Field 4 had been harvested for a time by the Japanese, and although the ground cover was almost entirely sheet lalang the palms had survived and seemed fairly healthy. The first generation of oil palms in Field 3 which had been bred from selected palms producing oil having a high carotene content were only distinguishable on the side of the track which had been re-opened up to the pumping station. The rest of the palms were completely overgrown by high secondary jungle growth.

Pasture areas were badly neglected and overgrown with lalang and weeds, especially sendudok and sensitive weed. Small areas had been grazed to some extent, most likely by cattle and goats owned by the plantation labour and the local squatters. These poor emaciated animals wandered at will over the old experiment areas.

In areas which had been used for foodcrops such as tapioca, sweet potato and maize, and later had been allowed to revert to natural growths, the predominant weed was lalang with the lines of the old drains marked by a vigorous stand of sendudok.

Coffee had survived well, particularly in the shaded areas, but the cinnamon trees in competition with Gleichenia fern and sendudok were moribund, and it seemed doubtful if they would survive. The same observation applied to cloves, which were heavily overgrown with *Passiflora foetida*; as they were defoliated, and manifested much "die back." Manila hemp, (*Musa textilis*), seemed to have competed reasonably well with secondary growths in spite of obvious neglect, particularly where it was inter-planted with *Gliricidia maculata*. Gambier, (*Uncaria gambir*), had survived but was weakly. *Derris elliptica* was almost completely invisible under secondary jungle growth but seemed healthy in the areas where it could be found, which was not easy owing to the thick overgrowth. The jelutong, (*Dyera costulata*), and rubber, (*Hevea brasiliensis*), appeared healthy and showed no obvious signs of disease.

The bungalows, laboratories, oil palm and tea factories and the School of Agriculture buildings had all been badly neglected, damaged, and looted a second time; this occurred during the period between the Japanese leaving and the arrival of the re-occupying forces. Most tools, small pieces of machinery,

laboratory equipment, furniture, books and records were missing; even fastenings and electrical fittings were torn out of the woodwork or broken. The scattered remains of broken wash-hand basins, toilet fittings and furniture demonstrated the depredations of the looters. During the Japanese time the experimental padi tanks, which were used by the Entomologist for work on padi stem-borers had been allowed to fall into disrepair and all piping, fittings, posts and all the wire netting associated with this installation were looted.

Conditions in July, 1946.

Oil Palms.—The old palms presented a very dismal picture of ill-health with leaves hanging forlornly down showing a preponderance of bronzed foliage and scanty, small, poorly formed fruit bunches. Even 6 months after slashing the heavy undergrowth and pruning the dead leaves the palms appear to be making but slow recovery, flowering and fruiting being poor; they can be classed as moribund. It would appear that on the poor hilly land of the plantation the cessation of annual manuring with the routine checking of excessive undergrowth has had a disastrous effect, probably due to the fact that most of the available food supplies had been absorbed by the competitive undergrowth, resulting in almost complete starvation of the palms.

One interesting conjecture advanced regarding the lack of fruit which has been noted on many estates throughout Malaya is that the unpruned leaves and high secondary growths have prevented the natural spread of wind-borne pollen from the isolated male inflorescences throughout the fields onto isolated receptive female inflorescences.

In comparison with the old areas, palms planted in 1939-41 have survived even more severe competition without undue harm. After the undergrowth and lalang were removed they commenced flowering and setting fruit normally.

Fruit.—In 1940, 3 acres of mixed fruit trees were planted in a small clearing in the jungle reserve; three different methods were adopted in planting and clearing these areas. While not strictly relevant to the subject, these methods are described in detail, and the conditions resulting from years of neglect are discussed in relation to them. In Block 1 the jungle was felled and burnt. Firstly tapioca was grown, and, after six months, fruit trees and coffee were planted amongst the growing crop. No weeding was done and light secondary jungle growth was allowed to develop. This method is one commonly adopted by Malays in establishing fruits in the kampongs.

Block 2 was opened up according to estate practice as follows. The jungle was felled and burnt; the land was then stumped and clean-cleared, and contour pitted to prevent any soil erosion. Planting holes 2 ft. x 2 ft. were dug and filled with top soil mixed with organic matter in the form of grass and weeds. After settling, the fruit trees were planted and the whole area sown with a mixed cover crop of *Centrosema pubescens* and *Calopogonium mucunoides*. Top shade was provided for the young plants where necessary and each had a ring of *Crotalaria anagyroides* planted in a circle about 1 ft. from the plant. Regular "ring weeding" was carried out. Fruit trees only were planted in this block.

In Block 3, the undergrowth and all small jungle trees were removed by cutting to ground level, and the large trees thinned out sufficiently to allow of planting and to permit high light to reach the young plants. Both fruit and coffee were planted, the former in holes 2 ft. x 2 ft. and the latter in holes 1 ft. x 1 ft. As the fruit trees developed, the jungle trees were gradually removed. Strip weeding was carried out where necessary. In order to minimize root competition by the jungle species, trenches were cut 3 ft. from the trees and 3 ft. deep over half the experimental area. The trenches were then re-filled with soil. The object of re-filling the trenches was to encourage the tree roots to grow into the trenches and not burrow underneath. Every 6 months these trenches were cleaned out, the tree roots destroyed and afterwards re-filled.

The whole of this 3 acre fruit area was abandoned by the Japanese in January, 1942, and rehabilitation could not be undertaken until the middle of July, 1946, during which time the jungle had almost retaken possession. On re-opening the area the following conditions were found.

Block 1 was a mass of sheet lalang and very few fruit trees or coffee bushes had survived.

Block 2 was still in fair condition; the cover crop had maintained a fair control of the ground surface; lalang was sparse, and practically all the fruit trees had survived. Rambutan trees, (*Nephelium lappaceum*), had made excellent growth and were carrying a good crop of fruit. Some of these trees are between 25 ft. and 30 ft. in height with an equal diameter of spread. Durians, (*Durio zibethinus*), had grown fairly well; one tree was outstanding. Mangosteens, (*Garcinia Mangostana*), however, had made very slow growth. Minor fruits such as soursop, (*Annona muricata*), bullock heart, (*Annona reticulata*), and custard apple, (*Annona squamosa*), which were planted in the middle of 1940 and early 1941, had mostly died out.

In Block 3 nearly all the fruit trees had survived in spite of being completely overtopped and confined by the jungle trees. All the trees were naturally very drawn with few side branches. Rambutans had made fair growth; durians had done well, and so had the mangosteens. The other fruits had suffered similarly to those in Block 2. The coffee was very ' leggy ' and almost moribund.

The harmful effect of taking off foodcrops, especially tapioca, in establishing a fruit orchard has been clearly shown in this experiment. Normal care and maintenance would have reduced this harmful effect but neglect had made matters worse. The area will be costly to work into condition again and much fertility has been lost by exposure, leaching and erosion.

It is considered that the method described in Block 3 would have proved very successful if the jungle trees had been controlled by cutting back as the fruit trees developed. The ease with which the young trees were established is a point not to be overlooked. This area is completely free from lalang.

The hardiness of the rambutan has also been demonstrated on this area and on other parts of the plantation. This is the outstanding high-grade fruit tree that shows no ill-effects from neglect. Fruit trees which suffered most were

the citrus in Field 17 and in the fruit nursery. Established durians, (*Durio zibethinus*), and pulasans, (*Nephelium mutabile*), have all survived. Avocado pears, (*Persea gratissima*), show much die-back, while minor fruits such as chempedak, (*Artocarpus polyphema*), bread fruit, (*Artocarpus integrifolia*), mango, (*Mangifera indica*), and machang, (*Mangifera foetida*), are in fair condition but there is much diseased wood in evidence and poor quality fruits are being produced.

The budwood nurseries had not been pruned since 1942 and had grown into young forests. Excellent budding material of rambutan, pulasan and durian is now being produced following coppicing.

Coffee.—An article* published in 1941 described a mulching experiment, and gave the results of the first two years. Mulching with cut grass at the rate of 20 tons per acre had given increased yields amounting to 127 per cent. for Liberian and 59 per cent. for Robusta in the second year.

In July 1946 the plots were examined; after 4 years neglect the mulched plots were very clearly distinguishable from the unmulched ones, so much so, that there was no need to refer to the lay-out plan. The coffee bushes in the unmulched plots were in poor health, the leaves were scanty and very yellow and fruiting was meagre. In the mulched plots the bushes were still very green, full of vigour, flowering and fruiting well; the residual effects of the treatment after 4 years were remarkable. There was of course no sign of any mulch, but the surface soil was not consolidated or eroded as in the unmulched area, partly due to the fact that the coffee bushes themselves now gave considerable protection from the sun and heavy, beating rain.

From these results we have evidence not only of the immediate value of coarse, unfermented, organic material to conserve the soil and its moisture and to act as manure but also of the very marked lasting value of such material on a permanent crop such as coffee.

Effect of Shade.—Throughout the plantation the value of light top shade such as produced by *Albizzia moluccana* was well in evidence. Crops showing such benefit were tea seed bearers which showed darker green foliage and suffered less from die-back. Fodder grasses grown under shade showed very marked improvement in growth and palatability when compared with plants growing in the open. Coffee bushes under the saga tree (*Adenanthera pavonina*), although neglected for 4½ years, were in fair condition, while those growing in unshaded plots had mostly died out. This beneficial effect of light shade can be attributed to:

(1) Partial suppression of lalang and secondary jungle growth.

(2) Maintenance of a higher moisture content and lower temperature of the soil resulting in a slower breaking down of organic matter which, in turn, results in retention of fertility and has a beneficial effect on soil structure.

(3) Value of the leaf-fall as a mulch and fixation of nitrogen by the roots.

* *Malayan Agricultural Journal*, Vol. XXIX, No. 2, February, 1941.

In connexion with shade trees, one ill effect of *Albizzia moluccana* planted with tea has been the large areas attacked by the red-root disease fungus (*Ganoderma pseudoferreum*). Whether the presence of heavy undergrowth and the neglect of the bushes had any effect on the occurrence of this disease or whether it would have occurred under normal conditions of maintenance is difficult to determine, but the inference remains that *Albizzia moluccana* should be avoided in Malaya as a shade tree for tea.

Appendix I.

List Showing Some of the Crops Lost During the Japanese Occupation.

FOOD CROPS.

Collections of *Alocasia* and *Colocasia*.

Greater and Lesser Yams. *Dioscorea alata* and *D. esculenta*.

Soya bean varieties, *Glycine hispida*, introduced from Java.

Sweet potatoes, *Ipomoea batatas*. A large collection of named varieties, both local and introduced.

Tapioca, *Manihot utilissima*. A large collection of local and introduced ' Sweet ', ' Bitter ' and early maturing sweet varieties.

Arrowroot, *Maranta arundinacea*.

Jerusalem artichoke, *Helianthus tuberosus*.

Sugar cane, *Saccharum officinarum*. Collection of named varieties, mainly from Java.

Bambara groundnut, *Voandzeia subterranea*.

Maize, *Zea Mays*. Several varieties representative of the Flint, Dent and Sweet Corns.

FRUITS.

Water Lemons, *Passiflora laurifolia*.

Grenadilla, *Passiflora quadrangularis*.

ESSENTIAL OILS.

Patchouli, *Pogostemon Cablin*.

Lemon Grass, *Cymbopogon citratus*.

FIBRE PLANTS.

Sisal hemp, *Agave sisalana*.

Mauritius hemp, *Furcraea cubensis*.

Roselle fibre, *Hibiscus sabdariffa*.

Bimlipatam jute, *Hibiscus cannabinus*.

SPICES.

Turmeric, *Curcuma domestica*.

Pepper, *Piper nigrum*.

Ginger, *Zingiber officinale*.

COVER CROPS.

Centrosema plumieri, *Desmodium gyroides*, *D. polycarpum*, *Indigofera endecaphylla*, *Pueraria* sp., and *Dolichos Hosei*, *D. ovalifolium*, *Tephrosia purpurea*, *T.Vogelii*, *Vigna marina*.

DYESTUFFS.

Indigo, *Indigofera arrecta*.

FODDER GRASSES.

Rhodes, *Chloris gayana.*
Australia Blue couch, *Digitaria didactyla.*
Dallis, *Paspalum dilatatum.*
Buffal, *Reana luxurians.*
Zoysia pungens.
Urochloa brachyura.
Stenotaphrum secundatum.
Apocopsis siamensis.
Amphilopsis glubra.
Setaria rabiginosa.
Paspalum orbiculare.

MISCELLANEOUS CROPS.

Tobacco, *Nicotiana tabacum.*

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"TEMBAKAU RACHIT"

BY

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During the second half of 1946, increased interest was taken by Javanese small-holders in the Kuala Langat District of Selangor in the cultivation and preparation of tobacco for local consumption. *Tembakau rachit* is a finely sliced tobacco made for smoking in *rokok puchok*, a prepared tobacco, using the dried immature leaves of the nipah palm, *Nipah fruticans*, as wrappers. The tobacco plants are grown on peat, which after burning is very suitable for tobacco cultivation, and, providing careful attention is given during the growing period, satisfactory yields are obtained.

There are two types of tobacco commonly grown in the Kuala Langat District:—

(a) plants having oval leaves with a wrinkled surface when fully developed and dark green in colour, and

(b) leaves elongated and tapering towards the tips and light green in colour.

The following notes describe the methods used in harvesting, fermentation, and preparation of the leaves for the production of tobacco by the Javanese growers at Kuala Langat.

About 18 to 20 leaves only are allowed to develop on each plant and at this stage the growing point is cut off. There are three stages of harvesting, each producing a different kind of tobacco. The first 6 to 7 leaves are harvested when the plant is about 2½ months old and the leaves have begun to yellow but have not withered. The lower 2 or 3 leaves at the base of the plant are discarded, but the remaining 4 leaves are dried in the sun and sold as chewing tobacco. The second harvest is undertaken a week later and consists of the removal of a further 4 to 5 leaves. The final harvest follows a week later when all leaves remaining on the plant are removed. These leaves produce the finest quality tobacco. Thus in about 3 months from planting harvesting is completed. It is estimated that the crop so obtained gives an average yield of prepared *tembakau rachit* of about 4 piculs per acre.

After harvesting is finished the plants are usually cut back to within 6 ins. from ground level and allowed to throw out secondary shoots. A yield of slightly more than half that obtained from the main crop is secured, i.e. slightly over 2 piculs per acre of prepared tobacco.

Harvesting is usually performed in the morning, and the leaves are spread on mats under the house unexposed to the sun. Any moisture on the leaves will have evaporated by the evening. The leaves are then stacked in piles, sometimes wrapped in coconut fronds, and stored for three days

in a cool dry situation, during which time the temperature will have risen and fermentation taken place. The leaves then show an almost uniform yellow colour as a result of the process of fermentation. On the fourth day the leaves are ready for slicing. Previous to this being undertaken the mid-ribs of the leaves are torn off up to about three-quarters of their length from the base. The leaves are then piled up, over-lapping one another so that the tip of the bottom leaf extends out of the pile. By this means, when the leaves are rolled up from the base for slicing, handling is facilitated. The number of leaves placed in each roll is sufficient to form a bundle convenient to hold in the hand. The rolled leaves are now ready for slicing. The bundle is next held in the hand and pressed on the platform of the slicing apparatus. This consists of a sloping wooden platform 4 ins. wide and about 1 ft. long, nailed at each end to a wooden block which is held in position by two uprights at the sides wedged in holes made on a bench which forms the seat of the slicer. A rattan band is tied round the top of the uprights in order to keep them in position. The bundle of tobacco leaves is then sliced with a very sharp knife. It requires a lot of practice before competence in slicing is attained. Smokers prefer the tobacco not too finely sliced as the flavour is then more bitter than when it is finely cut. Bamboo slats, about 5 ft. long and 3 ft. wide are used for drying the tobacco, which, after slicing, is spread on the slats as thinly as possible to ensure uniform drying and allowed to dry in the sun for three days. In order to hasten drying the slats are turned over completely every afternoon. The tobacco is very brittle at this stage and the turning is performed by placing another slat on top of the tobacco and turning the two slats upside down and then removing the one which is on top but was originally at the bottom. On the first night the slats on which the tobacco is spread are allowed to remain in the open air, unless there is rain, until as late as 11 p.m., and on the second night until about 10 p.m. This is done in order to allow the dew to collect on the tobacco and by so doing impart a shiny red colour to the finished product. On the evening of the third day the tobacco will have become soft, when it is ready for storing and finally smoking.

Before storing, the tobacco has to be compressed. This is done by placing the tobacco on mats direct from the slats. The mats are folded lengthwise over the tobacco and the whole is then trampled by foot. The tobacco is then folded into bundles of suitable sizes and wrapped in paper or dried banana leaves and stored in wooden boxes. It is considered that the longer the tobacco is stored the more fragrant it becomes.

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EMERGENCY FOOD PRODUCTION

BY

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In March, 1946, a Food Executive Committee appointed by the British Military Administration set up a Short Term Food Production organisation to carry out direct production of food stuffs in order to augment the country's supplies. This short-term food-drive was separate from long term food production in Malaya, and over-rode any long term considerations. The crops grown were those other than wet padi which remained the responsibility of the Agricultural Department, the land being any suitable area felled by the Japanese and any State or Forest Reserve Land which could be made appropriately available. The general policy was to clear the land by means of mechanical equipment, in order to economise in labour, and to use Japanese Surrendered Personnel. These areas, known as Government Farms, were then either planted by the Government itself or handed over to settlers. It was clear from the beginning that, owing to a world shortage of supplies, equipment and stores, the task would be a difficult one. In spite of this, progress was made, and at the end of February, 1947, 5,777 acres of land on such farms had been cleared.

As regards mechanical equipment, tractors were hired from the Army in Malaya, and, towards the end of the year, more were obtained from the American Army in Manila. All are not yet in working order as many of those obtained from Manila arrived late in 1946 and have not yet been serviced.

The supply of agricultural implements also presented a difficulty as most firms in the United Kingdom appeared to have none available for export. Here too, some were hired from the Army, and it was possible to obtain some cultivator-units and disc-drills from Australia.

With the more settled conditions prevailing at the end of February, 1947, the Government felt that the time was opportune for achieving food production on a wider scale than that previously possible and recognised that the agricultural population itself was the best source of such increased production. As the Department of Agriculture had now been largely re-staffed with its permanent officers, it was able to undertake, in addition to its substantive duties, the extra work of administering this scheme for increased food production. To this end the Government has allocated responsibility for all food production in Malaya to the Director of Agriculture from March 1st, 1947. The " Short Term Food Production " organisation has accordingly now been absorbed and emergency food production now forms an important branch of the activities of the Department of Agriculture.

General Policy.

In view of the fact that imports of cereals are likely to be in short supply in the latter part of 1947, first priority is being given to the growing of padi, maize and groundnuts, in the present padi off-season, and every effort is being made to ensure an increased cultivated acreage of wet padi for the 1947/48 crop. Off-season foodcrop cultivation, moreover, when situated in wet padi areas, will be so timed as not to interfere with the planting of the main padi crop. The planting of extra food crops will be encouraged through the medium of propaganda, the provision of land on attractive terms, the supply of seeds and tools, and, where desirable, the provision by the Government of grants or loans. If growers are not forthcoming, contract labour will be employed. The policy with regard to the employment of mechanical equipment for the production of food has changed from the previous one of accepting mechanisation as a means of food production on a large scale to one of investigating by experiments the possibilities of using mechanisation in both dry and wet padi conditions. The work to be done falls into four divisions: (a) the growing of off-season crops, (b) increasing the area under wet padi, (c) the growing of crops with contract labour, mainly on Government Farms, and (d) the carrying out of rapid and accurate investigations into the possibilities of mechanised production of food.

Off-season Crops.

The first step in increasing the production of off-season crops was the guaranteeing of prices for the most important of the rice substitutes, and prices which will continue until the end of 1947 were accordingly gazetted:—maize, $15 per picul; groundnuts, $20 per picul; and arrangements were made within each State or Settlement for all growers to be informed of these prices by State Agricultural Officers. At the same time, further encouragement has been given to the production of these crops by propaganda by all appropriate Departments. It has been too late to do much in this direction in most districts, but large acreage will be planted in the Tanjong Karang area of Selangor and in the riverine districts in Kelantan; while in Malacca and Province Wellesley, where cultivation of crops in the off-season is a normal agricultural practice, a considerable increase in the area of wet padi land planted with off-season crops is expected.

Padi Schemes.

As a long term policy, the Drainage and Irrigation Department with other Departments, had in hand the development of large irrigation schemes in many parts of the Peninsula, for example, at Sungei Manik and Changkat Jong in Perak, at Tanjong Karang and Panjang Bedina in Selangor, and at Endau and Kahang in Johore. Attempts are being made to increase the acreage under production in these areas and also to improve water conditions in many of the smaller wet padi lands, which had, in most cases, been neglected during the Japanese occupation. This, it is hoped, will have

the effect not only of increasing the total acreage planted with wet padi in the 1947/48 season, but also of increasing the yields in many fields which gave poor or mediocre returns last season. Agricultural Officers of the Field Branch have been examining these smaller padi areas to see whether improvements may be made, and in the large States, such as Perak, work mainly in the mature of the building of temporary dams and the digging of drainage channels, is necessary on 61 of these areas, comprising 11,862 acres. These proposals are then discussed with officers of the Drainage and Irrigation Department and Land Offices and a general programme prepared so that co-operation between all Departments will ensure that the funds available are used to the best advantage. Most of the constructional work is being done by hand, generally on contract, but, where feasible, mechanical equipment is used, for example, in constructing access roads to Sungei Manik and in repairing the bund along the Malacca River.

Plans are also being made to organise loans to padi planters where they are considered to be necessary. In Kedah it is hoped to make a loan of $500,000 available for the supply of bat guano. Similarly it is hoped to provide long term loans for cultivators in Pahang, to enable them to replace their buffaloes, depleted during the past four years, which are necessary for the cultivation of deep padi areas.

Government Farms.

As a preliminary to making decisions on the future policy with regard to these farms, a Technical Committee, comprising the Chief Research Officer, the Chief Field Officer and the Senior Agriculturist, inspected all Government Farms and submitted a report to the Director of Agriculture. The general policy recommended was that, wherever possible, a rice substitute crop, generally either groundnuts or maize, should be obtained immediately, followed by dry padi in August, but certain areas of low fertility, or where soil erosion is serious, are to be planted with cover crops. Further stumping by means of bulldozers, which generally results in the loss of the top soil, will cease, except on those farms where Government is already bound by contract to stump certain fields.

At Ulu Gali in Pahang it was recommended that the farm should be converted into a wet padi area. The Drainage and Irrigation Department was consulted and a scheme designed on which work has already started. Here its seems likely that a sufficient number of settlers will be forthcoming. On other farms situated on State land, certain areas already cleared will be handed over to settlers, generally with two-year tenure, for cultivation of dry land crops.

Investigations with Mechanical Equipment.

Investigations into the mechanical production of padi in both wet and dry conditions are being started, the former in Lower Perak in Stage IV of the Sungei Manik Irrigation Scheme, and the latter at the Sungei Buloh Farm, near Kuala Lumpur. The soil in Sungei Manik, which contains a high proportion of peat, is by no means ideal for mechanical cultivation,

but it is typical of much of the land which is likely to be opened by the Drainage and Irrigation Department in the future, for instance in the 166,000 acre Perak River scheme. Most of the existing padi Irrigation Schemes are designed so that one cubic foot of water irrigates 50 acres; this is probably insufficient for mechanical cultivation, so that mechanical cultivation, if practicable at all on a large scale in Malaya, is likely to be confined to new areas. It will be seen that this revised policy will not require as large a number of heavy tractors as the previous one and arrangements have already been made to return those hired from the Army, on which considerable rent was being paid. As soon as it has been ascertained how many tractors may usefully be employed by the Department of Agriculture or by the Drainage and Irrigation Department on schemes of the type outlined above, the remainder will be taken up by other Government Departments to help in the general rehabilitation of Malaya.

Organisation.

While the administration of the food production drive is the responsibility of the Director of Agriculture, for purposes of efficiency and speed the decentralisation of administration and execution is being effected in the respective States and Settlements through the State Agricultural Officers They will give technical advice on all matters required on the part of growers and will assist in the supply of seeds, tools, grants, loans, and other facilities in connection with land occupation. The Short Term Food Production organisation has thus become absorbed in the Department of Agriculture. The Farm Managers are now titled Food Production Officers and come under the immediate administration of State Agricultural Officers. To render assistance in administrative matters, and for the purpose of co-ordinating schemes, an Agricultural Officer on the permanent establishment has been transferred from the Field Branch with the title of Agricultural Liaison Officer.

Summary.

The summary of the present position is that, on the instructions of H.E. the Governor, the Short Term Food Production organisation has been absorbed by the Agricultural Department. In view of the continuing shortage of cereals both locally, and in the world in general, as many off-season crops of rice-substitutes as possible are being planted and steps are to be taken to increase the acreage and yield in the coming 1947-1948 wet padi season. The personnel, funds, and equipment of the former Short Term Food Production organisation will now be used for these purposes. State and Settlement Agricultural Officers will now be responsible to the Director of Agriculture for all aspects of the food production drive in their States and Settlements. These aspects may in conclusion be divided into four parts:—

1. the encouragement of the planting of off-season padi substitute crops, such as maize, groundnuts, and cow peas;

2. the accelerated settlement of new padi areas and, in co-operation with the Drainage and Irrigation Department, the improvement of water conditions in existing ones so as to increase both the total acreage under wet padi and average future yields.
3. the production of padi and padi substitute crops, on such areas of the Government Farms as are considered likely to be profitable, both by mechanical and hand labour;
4. investigations into the possibilities of the use of mechanical equipment in the production of padi grown under both wet and dry conditions.

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Selected Articles.

THE FOOD AND AGRICULTURE ORGANISATION*

Relatively little publicity has been given in the Press or elsewhere to the activities of the Food and Agriculture Organisation, though from the various reports that it has issued a great deal of essential preliminary work has evidently been accomplished. A staff of highly competent experts has been temporarily on loan from Government departments and other international bodies for the purpose, though now a nucleus of permanent personnel is established, to which recruitment is to be made on as broad a geographical basis as possible. At the time of its inauguration in November 1945, responsibility for dealing with the immediate post-war world shortage of food was in the hands of international organisations such as the United Nations Relief and Rehabilitation Administration, the Combined Food Board and the Food and Agriculture Sub-committee. By the time that these bodies were due to go out of existence under the arrangements already made, it was hoped that the worst of the food shortage would be over, and that the new authority would start to develop its plan under conditions approximating to those of 1939. Its first task was, therefore, to assess the pre-war position in as many countries as possible as a guide to working out future policies. During the winter of 1945-46, however, serious deterioration in the world's food supplies set in, and following an appeal for help, the Director-General agreed that the Food and Agriculture Organisation should undertake responsibility for relieving the situation. A special meeting was called at Washington in May, 1946, at which recommendations were made to Governments as to the best use of the 1946 harvest and the ways in which still larger harvests could be secured in 1947. Allocation of foodstuffs, based on information and statistics provided by the Organisation, was delegated to a new agency, the International Emergency Food Council. An inquiry was then called for to ascertain the adequacy of existing international institutions to meet long-term problems of production, consumption and distribution, including surpluses.

Two important publications were the outcome of this meeting. "World Food Survey" and "Proposals for a World Food Board"†. The first is a study of the pre-war food consumption figures for seventy countries, comprising 90 per cent. of the world's population. It includes targets drawn up by nutrition experts with the view of providing everyone

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* *Nature*. Vol. 159, No. 4033, February 15, 1947.

† Food and Agriculture Organisation of the United Nations. First Annual Report of the Director-General to the F.A.O. Conference. Pp. iv + 45.
World Food Survey. Pp. 39.
Proposals for a World Food Board. Prepared for submission to the Second Session of the Conference of the Food and Agriculture Organisation, Copenhagen, Denmark, 2 September, 1946, Pp. iii + 12.
(Washington, D.C.: U.N. Food and Agriculture Organisation, 1946).

with an adequate balanced diet, together with a budget of world requirements in 1960 if such targets are to be reached, due allowance being made for population increase in the meantime. The figures are inevitably incomplete, but are probably accurate to within 5 per cent. for countries with a high calorie intake and 10 per cent. for areas where the consumption is low. The extent of the malnutrition can be estimated from the finding that more than half the world's population had a pre-war calorie intake of only 2,250 a head a day; less than one third had available 2,750 or more calories. The deficiency was greatest in Central America and most of Asia, whereas the high-calorie groups occurred chiefly in North America and European countries; though it is realized that average figures inevitably conceal sharp variations owing to uneven distribution.

Further, the proportion of the various types of food yielding a similar total in calories may depend on national diet. Denmark and New Zealand, for example, are both countries with a high average food intake and a well-balanced diet; but though their consumption of cereals was equally low and that of milk equally high, wide differences were shown in regard to intake of animal protein and fat. Abundance of supplies and adequate purchasing power, however, resulted in a satisfactory diet in each case. In some of the countries in the low-calorie group, such as Java, the malnutrition was worse than the total figures suggest, since the proportion of cereals consumed was too high and the protein and fat consumption quite inadequate to maintain health. As a basis on which to work, estimates of the various foods needed by the world in 1960, if the calorie intake per head per day in the low-calorie groups is to be raised to 2,550-2,2,650, have been put forward by nutrition experts. The proportions of the different types of food comprising this total are roughly indicated, as the primary aim is to improve the balance between the various components of the unsatisfactory diets rather than attempt to alter the habits of any country.

For such a target to be achieved, production will need to be raised considerably, though the actual increases required vary widely with the different commodities, ranging from 12 and 21 per cent. respectively in the case of sugar and cereals, to 100 per cent. for milk and 163 per cent. for fruit and vegetables. Increased production in its turn implies improvement in agricultural methods. More fertilizers and machinery will be wanted, irrigation and drainage schemes must be carried out, and deteriorated areas reclaimed. The application of science to agriculture, however, does not necessarily provide the solution; it may even create its own problems, as, for example, the accumulation of local surpluses, so that proper distribution becomes the major difficulty. Economic and social changes are also called for, such as the large-scale development of industry and trade, educational services, and some machinery for supplying credit to farmers. Positive action on an international scale to plan and organise production, marketing and finance would be needed to implement these recommendations, and in a further report the formation of a World Food Board was proposed. This

body was envisaged as a central authority, empowered to hold reserve stocks of the more important commodities, to provide funds for financing the disposal of surpluses, and to co-operate with organisations concerned with international credits for industrial and agricultural development. Later discussion, however, rejected the scheme in this form, and proposals of an alternative nature were put forward.

In September 1946, the second meeting of the Food and Agriculture Organisation was held at Copenhagen. Five new member nations were admitted, bringing the total to forty-seven. The principal concerns of this conference were to appraise the Organisation's work during the previous months and to make a start with the major problems of a long-range world food policy. One special feature was the approval of the report of the Commission to Greece, which at the request of the Greek Government had carried out a survey of the agriculture, forestry and fisheries of the country, and made recommendations for future improvements and development. It was the first of this type of enterprise undertaken by the Organisation, though the extension of such services to other countries, as requested, is likely to be a feature of its activities in the future.

Though the Copenhagen conference did not lose sight of the fact that there is still an urgent need for maximum food production, avoidance of loss during storage and continued controls and economies in the use of all basic foods, the chief interest was naturally centered on the long-range programme. For this purpose a Preparatory Commission was set up to develop the proposals for inter-governmental action to prevent the occurrence of both shortages and surpluses of food and other agricultural products, and, in particular, to consider the proposal already put forward for a World Food Board. The Commission consisted of representatives from sixteen member nations, three non-member nations with major or specialized food resources also being asked to participate. In addition, co-operation was invited from various inter-governmental organisations connected with trade, health and finance. The principal findings of this Commission have now been announced. Though entirely in agreement with the essential features of the plan put forward by Sir John Boyd Orr in his proposal for a World Food Board, it has recommended that, in place of an international authority itself holding reserves of food and purchasing power, co-operation should be worked out between the nations on a voluntary basis. Reserves of food should be built up nationally, but they should be operated inter-nationally; orderly marketing policies should be framed and price-levels for a term of years fixed by international agreement. A World Food Council representing eighteen nations is suggested, which would work in close liason with the Food and Agriculture Organisation, and meeting if required at intervals between the conferences of the latter. The proposals fit into the general scheme of the United Nations Organisation, and allow of close co-operation with existing agencies, among which the International Bank may be specially mentioned.

A policy of expansion is the keynote of the programmes suggested, both as regards food production and the development of industry and social services in rural areas. The carrying out of the proposals, however, depends on the various Governments concerned; for they will have to provide the necessary facilities and co-operation if the aims of the Food and Agriculture Organisation are to be realized, and adequate food, at a fair price, be made available to all. The scientific and technical views, based on a critical examination of the data available, have been set out; it is now the task of the statesmen of the world to frame their policies to fit the facts of the situation.

RUBBER*

Brazilian Exports 1942/45

Rubber has already occupied the position of one of the most important items on the list of Brazilian exports. However, despite difficulties through which rubber production has passed during the last few decades, the economic value of the product has in no way decreased. Its possibilities are immense, not only from a commercial point of view, but also under the present circumstances as a strategic material, and as such, it is essential that production should be developed along adequate lines, by a rationalization of the methods of extraction, as much as by the application of scientific methods of planting, the success of which has been thoroughly demonstrated in the eastern countries, which have specialized in the culture of the rubber tree.

It is a matter of general knowledge that Brazil was the largest source of rubber in the past. About forty years ago, 65% of the latex used in the industries of that period originated in Brazil.. Production which approximated to 394 tons in 1839-1840, had risen to 39,000 tons in 1909, or three fifths of the world output. In 1910 exports amounted to 276,000 thousand cruzeiros of crude rubber, a figure only slightly below that of our principal export, coffee.

This gives an accurate idea of what the product meant as a contribution to the trade of Brazil in general and to the economic advantages of the population of the country in particular.

Various circumstances were responsible for Brazil's loss of the supremacy on the international rubber markets. The transplantation of rubber trees to the East, where they became the object of intensive and rationalized culture, placed the national product in a disadvantageous position from the point of view of production costs, selection, and the preparation and standardization of definite types, was, however, the principal cause of the depression. The situation was further aggravated by the fact that, for motives of a rather complex nature, and principally on account of the lack of financial resources, Brazil adhered to traditional and routine methods of production ignoring the technical revolution that set a new course for rubber economy.

Consequently owing to these factors the national product failed to rise above the low level in which it found itself at the close of its prosperous age and little variation took place, either in the volume of production or in the value obtained. As to the quality of the product and the improvement of types, no modification can be noted which exercised any appreciable influence on the production taken as a whole.

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* *Brazil Trade Journal*, April-June, 1946.

The production of latex in the American Continent is derived almost exclusively from the Amazon basin, where the number of trees is estimated at 300,000,000, with a potential productive capacity of 600,000 tons of rubber annually the greater part of which lies in the territorial limits of Brazil.

The largest volume of the world's natural rubber output is obtained from *Hevea brasiliensis*, a tree of considerable height although it has been acclimatized, with success, in other regions; its natural habitat is the north of Brazil or more exactly the jungle of the Amazon basin. In some States of the North-East and Central regions of Brazil, a certain amount of latex is extracted from a variety of other plants which grow wild and are tapped for rubber, though the quality is considerably inferior to that of the true Hevea.

Although Brazil's output is as yet insufficient to fill the requirements of world's industry, the prospects are now encouraging. In her position as principal producer of latex in the hemisphere, Brazil, by carrying into effect a well planned constructive program, may well recover the greatest part of its former markets.

The most important of these markets is the United States. The needs of our great industrial neighbour, in normal times, exceed 600,000 tons of latex, feeding an industry which employs more than 120,000 workers and claims of a production estimated at 900,000,000 dollars.

But the lure of foreign markets should not blind us to the future possibilities within our own boundaries. The vigorous expansion of Brazil's economic activities has promoted a corresponding development in home industries, such as the manufacture of all kinds of finished products with rubber as basic raw material. This branch is daily acquiring greater importance, specially in the field of tyre and inner tube manufacture. The rate of progress along these lines justifies the most encouraging expectation of industrial self sufficiency in a none too distant future, thus eliminating the import of these articles.

It is, however, the shifting of ocean traffic lanes which has fortified our position as rubber producers. In view of the war the United States saw her supply lines from the Far East cut off and this situation, combined with a rapidly increasing demand and an acute shortage of rubber, raised the Brazilian latex up to a position of high strategic value.

An agreement was signed in Washington between the Brazilian Government and the Rubber Reserve Corporation, representing the American Government for the development of rubber production.

As a result of this agreement it may be predicted that Brazil will be again among the leading producing countries, if not in quantity, surely in quality.

Brazilian Rubber Exports 1912/1945.

Years	Quantity in tons	Value in Cr$ 1,000	Years	Quantity in tons	Value in Cr$ 1,000
1912	42,286	241,425	1929	19,861	61,114
1913	36,232	155,631	1930	14,138	33,584
1914	33,531	113,598	1931	12,623	25,599
1915	35,165	135,786	1932	6,224	10,626
1916	31,495	152,239	1933	9,453	21,687
1917	33,998	144,080	1934	11,150	33,642
1918	22,662	73,728	1935	12,370	36,063
1919	33,252	105,537	1936	13,247	68,016
1920	23,586	58,350	1937	14,792	76,001
1921	17,439	35,903	1938	12,064	46,649
1922	19,855	48,760	1939	11,805	56,680
1923	17,995	81,177	1940	11,835	77,467
1924	21,568	79,212	1941	10,734	91,185
1925	23,537	191,803	1942	12,204	148,416
1926	23,263	114,877	1943	14,575	189,057
1927	26,162	115,008	1944	21,192	365,839
1928	18,826	58,999	1945	18,887	345,924

TEA RESEARCH IN RELATION TO ADVISORY WORK*

(A lecture delivered to the Morawak Korale Planters' Association)

There are two mutually exclusive heresies that continually crop up in the advisory work of the Institute. One is that a method perfected, or a discovery made, in one set of circumstances can be applied in others with equal success. The other is that every estate or district is a law unto itself and therefore generalisation is impossible or unprofitable. Both of these statements are too sweeping: the truth lies somewhere in between. It is the function of scientific research not only to make, if possible, new discoveries but to trace and define the underlying similarities that exist in apparently different circumstances. Having done this, sound advisory work concentrates on applying these generalisations with such modifications as local conditions demand. I understand that in this district you are much exercised in your minds as to what application the work we do at St. Coombs has to your conditions, and I shall use my time with you to-day in trying to clarify this issue.

The problem is simplified for us to some extent by the fact that we are growers of a single crop. We do not have to arrange our agricultural system to include crops of widely different types and requirements. Our main concern is to fit our one crop and its cultivation into a variety of environments. Each specific environment is governed by two main factors: (1) soil, (2) climate, which interact with one another and have a profound effect on a third, the biological factor. This factor is sometimes overlooked except in its harmful manifestations as plant disease. In this district the presence of Helopeltis is an example of a biological factor peculiar to your environment.

In Ceylon the soil factor is more uniform than in many countries, and at any rate the tea districts show no tremendous differences in character of the soil. There are differences, but these are more in degree than in type. The rocks from which the soils are derived are closely related: the weathering conditions under which they have been formed are not markedly dissimilar. This is very important because a uniform type of weathering will produce the same type of soil from quite different rocks. To come to practical properties, nearly all our soils are acid. They are porous and workable unless they have been grossly mismanaged. Although erosion is a serious problem our soils are only moderately erodible. They are, in fact, soils of good structure. Except when intensively cultivated they are low in nitrogen; they are deficient in phosphorus but have a relative abundance of potash. We have no sailt problem, and as far as we know there are no marked deficiencies in the rarer mineral elements, lack of which devastates

* By Dr. T. Eden. *The Planters' Chronicle*, Vol. XLI No. 16, August 15, 1946.

agriculture in many places. The one thoroughly objectionable soil type that is entirely detrimental to tea is that derived from limestone. There is a little of this in the northern reaches of your district, but in the tea districts as a whole it is of small importance. There are, as I said, some differences. Up-country we have no typical laterite or cabook, but agriculturally our red earth soils behave similarly though to a modified degree.

When we come to climate, the story is different. Small as the area under tea is, there are within it marked variations in rainfall, humidity and temperature, and of these temperature is probably the most important. As regards rainfall and humidity, the perennial deep-rooting habit of tea acts as a considerable safeguard against severe loss by drought, in comparison with what happens to annual crops in like conditions. As you are aware, the greater part of the solid tissues of a plant are derived from carbon dioxide in the air. The efficiency of the process of carbon assimilation is affected both by temperature and light intensity, but the predominating factor is light intensity. Temperature does, however, influence the balance between that portion of the carbon which is used for active growth and that which is held in reserve, to the detriment of the latter. To put the idea colloquially: at low elevations tea leads a more hand-to-mouth existence than in the cooler regions. I shall return to this matter later.

High temperatures speed up the chemical processes not only in the higher plants such as tea but in the host of micro-organisms associated with soils and plants. Decay, the result of micro-organic growth, is accelerated. In the soil, nutrients are more easily released and wasted and in the plant the tissues when invaded by harmful organisms decay at a greater rate. You will observe that what I am describing is not a radical change in the physiology of the tea bush but a quickening of the tempo at which it lives.

So far I have dealt in general terms with the differences in environment that are encountered in our tea districts. I propose now to deal with some of the questions that have been investigated by the Institute and to indicate what generalisations emerge from the results obtained and under what circumstances these need modification in different environments. Ever since the foundation of the Institute we have been studying the problems of manuring. From what I have said about our soils it is apparent that our experiments at St. Coombs will have a wide application. The results of these have been set out in our journal and annual reports and I will merely summarise the conclusions up to date. For doses of nitrogen up to and beyond those in practical use the proportionality of dose and yield is an established fact. During the rationing period for manures the applications of nitrogen have been limited. Some people thought that such small doses would be ineffective, but experience has not proved them correct.

Phosphates do not give a response proportional to their rate of application. Above 30 lb. per acre the increase is very small and economically negligible. This is in accordance with experience on similar soils all over the world. Recently an observation of a novel kind has been made

in respect of phosphatic manuring: that it has a remarkable effect on weed growth. Not only is a heavy weed population encouraged by phosphates, but even when no further growth is engendered the phosphate continues to increase in the weed tissues, and, under a system of clean weeding, is consequently lost for ever to the major crop. Potash applications are just beginning to show an effect when compared with plots starved of that element for 15 years. As regards weed growth the influence of potash is negligible in promoting growth; but, as with phosphate, it piles up in the tissues and is consequently a dead loss.

These general results which apply over a wide range of environments may in practice be vitiated by an unfavourable pathological factor. Evidence is accumulating from the Entomological Division that shot-hole borer, by causing large-scale branch breakage and loss of plucking points, can nullify the normal responses to manuring.

Turning from the question of manuring in general to time of application in particular, this is an aspect where climate has a marked effect and where uniformity cannot be expected. Manuring in a drought is not to be recommended, because not only are the feeding roots at a minimum of activity, but those remaining in action are likely to be damaged by dry weather cultivation. Temperature also has a bearing on time of application of manures in relationship to time of pruning. At high elevations applications of manure immediately after pruning have been found to be relatively ineffective. This has been traced to the fact that a clean-pruned bush is unable to use the nitrogen supplied as manure till it has grown a good canopy of leaf. In low-country districts where clean pruning is not practised, and where the leaf canopy is quickly re-established, the necessity for delay in application of manure does not exist.

The mention of different styles of pruning takes us back to what I said previously about tea in low-country districts leading a more hand-to-mouth existence than up-country tea as regards stored food reserves. One of the first discoveries made by the Institute was that of the real cause of deaths after pruning in the low-country. Previously these deaths had been attributed to the *Diplodia* fungus. In fact, they were due to the exhaustion of reserve food supplies in the root. By clean pruning, which at the time was extensively practised at all elevations, the bushes were deprived of the very tissues which manufacture carbohydrates on which new growth after pruning depends. The experiments on pruning methods which followed this discovery verified the observation that carbohydrates do not accumulate to any extent in root tissues at low elevations and suggested a method whereby these details could be prevented. By adopting cut-across pruning which leaves a considerable amount of foliage on the bush, or by leaving 'lung' branches to function during the critical period, deaths and dieback were successfully prevented. One or other of these methods is now standard practice at elevations below about 3,000 feet.

You have asked me to deal with the question of regeneration of tea, and this is the place to do it. I shall not allow myself to be manœuvred into an argument as to whether a tea bush suffers from senility, but shall stick to verifiable facts. When you say that a field needs rejuvenating you mean that its bushes are low yielders; the new wood is spindly or scarce; the old wood is scarred with pruning cuts, and furrowed with wood rot. I spoke earlier of the increased wastage due to higher temperatures favourable to micro-organisms. To set against your quicker bush growth you have the disadvantage of more rapid wood rot. The old practice was to cut away all the worthless wood by collar pruning and try to grow healthy wood from the collar. The devastating results of this method have been shown on countless fields, and, bearing in mind what I have just said about starch reserves, the result is a necessary consequence of the cause. The most rational way to rejuvenate a low-country field is to grow new plants and to grow them in such a way that the possibility of invasion of pruning cuts by wood-rotting fungi is minimised. I shall return to this in a moment. Here I wish to say that rejuvenation by supplying is a well nigh hopeless task if the majority of the supplies are singletons. The competition from the adjacent bushes dooms them to failure. Supplying in patches is the only reasonable alternative, but it calls for a shrewd decision as to when to sacrifice a bush which is on the downgrade but not a perfectly obvious candidate for removal.

A programme of supplying poses the question 'With what?' The usual alternatives are stumps and seed-at-stake or basket plants. If the Institute's work on propagation of selected material by cuttings fulfils its present promise, this method of rearing young plants will have to be taken into consideration by progressive planters. Stumps have the disadvantage that by the time they have a good supply of self-supporting foliage a large centring cut is necessary, and that paves the way for wood rot. Seedlings and cuttings grow with a more favourable habit. They can be cut across early in an operation that is little more than tipping into red wood. This besides leaving some foliage, ensures that the smaller cuts have a real chance of callusing. The lower branches will thicken and in time build up a clean frame which need never be touched in its lower regions. In this way there is the possibility of eliminating the far too common sight of a bush with severe wood rot at the centre.

The proposal to use rooted cuttings as material for supplying is a novel one to which my colleague Dr. Gadd is devoting attention. In our experience growth of cuttings is equal to, if not greater than that of seedlings of the same age when the propagating material used is good. In addition the resulting bushes are better and more uniform than those obtained from seedlings. I do not propose to deal with the technique of raising cuttings. You will find a detailed description of the method in an article in the *Tea Quarterly* by Mrs. Bond and myself. What needs to be insisted on is though I have mentioned certain advantages that are

possible with cuttings, the main factor in promoting success is to propagate a bush of good type. It is no use using cuttings from bushes chosen at random. The whole argument for 'rejuvenating' is to finish with something that is better than the original. That means selection and pre-eminently selection from your own fields. The habit of the bush, the cleanness of its wood and abundance of flushing points are prime considerations. Supplying by cuttings is not a method that can be put into large-scale operation now. It needs observation and experiment which only you can do. We have demonstrated its possibilities. Its practical application will be in your hands.

Digest.

NEW WAYS OF PREPARING TAPIOCA AS A SUBSTITUTE FOR RICE

The people of Malaya became very tired of eating tapioca during the Japanese occupation, and now are very unwilling to grow it and eat it even though there is a serious shortage of rice and prices of rice are accordingly very high.

Considerable interest attaches therefore to a paper prepared by the office of the Special Commissioner in South East Asia which describes the methods of preparing tapioca in South America, where, over large areas, and known as manioc, it has always been a staple article of diet. The preparation of tapioca in South America which is chiefly used is called "farinha" or "farine." It is a digestible and satisfying preparation. But, in Malaya and apparently in other territories of South East Asia into which tapioca has been introduced, a flour called tapioca flour is the main preparation. This differs from farine in that it consists mainly of starch washed out of the roots. This starchy flour contains only about one third of the proteins of the roots, whereas farine contains most of the protein of the roots, and a little of the starch has been washed away. All roots are poor sources of protein and cannot be recommended as staple articles of diet unless they are well supplemented with fish or some other food rich in proteins, but farine is the best preparation of tapioca root; it is more palatable, satisfying and nutritious than the starch flour. It is probable that, if it is properly prepared, it will be acceptable during a shortage of rice to the majority of the population. It keeps well when stored. Farine and not tapioca flour, should be stored against an emergency.

The method of making farine is as follows:—

(i) The roots are peeled and washed, or they are soaked for up to 4 days in water and the peels rubbed off.

(ii) The peeled roots are grated by rubbing them on galvanized or ordinary sheet iron in which a number of holes have been punched so as to leave jagged, protruding edges.

(iii) The grated pulp is placed in basket work strainers and pressure applied to squeeze out the juice, which contains prussic acid. This juice is used as a by-product; it is boiled to the consistency of treacle, which removes the prussic acid, and used to prepare "pepperpot" and other sauces.

(iv) The grated pulp is dried on iron plates or shallow cauldrons over a fire, and is agitated so that it breaks up into a coarse flour, or it may be dried as cakes.

In the Amazon valley the type of farine resulting from first soaking the tapioca root in water for four or five days is called "farinha d'agua", and is the type most favoured as being more palatable. On the other hand

the farine made after a very brief preliminary soaking or without any preliminary soaking is more easily digestible.

Farinha entirely replaces bread in most parts of the Amazon country and is often the only food consumed by entire families for weeks on end. Boatmen and other workmen engaged in extremely hard work for long periods are quite satisfied so long as their supply of farinha is assured, and the only supplies carried for long trips into the interior consist of farinha and a little dried salt beef or salt fish.

As an emergency food, farinha has many advantages; it is a concentrated foodstuff, sustaining, and at the same time quickly satisfying the feeling of hunger. Above all, it can be stored for long periods without being attacked by insects.

The coarse farine flour, without further cooking, makes a pleasing addition to soups, boiled vegetables, boiled or fried fish, curries and many other dishes.

Notes and Comments.

GOVERNMENT GUARANTEED PRICES FOR PADI AND FOODCROPS.

In order to cover the purchase of padi from next season's crop, the main harvesting of which will take place during the first quarter of 1948, the Government guaranteed prices of $20 and $19.20 per picul for padi delivered at the mill and purchased in the field respectively, will now be paid up to 30th June, 1948, instead of 31st December, 1947, as originally notified.

Government has also announced guaranteed prices of $15 per picul for the purchase of maize and ragi and $20 per picul for groundnuts. These prices will be effective up to the end of 1947.

COPRA AND COCONUT OIL.

An official communique issued early in March stated that the United Kingdom Ministry of Food had agreed to buy Malayan copra and coconut oil at £40 and £70 sterling per ton f.o.b. respectively.

NEW PLANTING AND REPLANTING OF RUBBER.

By Gazette Notification dated 13th March, 1947, the restrictions on, or prohibition of, new planting or replanting of rubber in the Malayan Union have been cancelled. Similar action has been taken in the Colony of Singapore.

TEA CULTIVATION IN MALAYA.

Recently compiled statistics show that 23 tea estates are now in production, all in the Malayan Union. The total planted area of tea in the Highlands is 4,744 acres, and of Lowland tea 2,573 acres, making a total of 7,317 acres as compared with 8,898 acres at the end of 1940. Total production of made tea is at present in the neighbourhood of 60,000 lbs. per month.

"The Planter"

The Planter makes a welcome reappearance with it's January number, the first issue since 1941. This magazine is to be published monthly as previously, and the annual subscription is $24. It is good to see that the well-remembered correspondent "Don" has successfully survived the war, and his pen is as caustic as ever. An article by Mr. C. C. T. Sharp, acting Head of the Botanical Division of the Rubber Research Institute of Malaya, gives details of the yields and other characteristics of the R.R.I. Clones. An address entitled "Naturalistic Methods in the Control of Malaria", given by Dr. J. N. Dugdale to the Johore Branch of the Incorporated Society of Planters, is reprinted.

The issue also includes particulars of the Cowgill Scholarship at Durham School donated by Mr. J. V. Cowgill, C.M.G., who was British Resident, Negri Sembilan, before the Malayan War. The Scholarship is primarily intended for the sons of parents of British or British Dominion nationality who have been resident in Malaya not less than 10 years.

To quote the editorial "The thing that matters most is that the Mother of this periodical, the Incorporated Society of Planters, is on its feet again—not unscathed, but more virile than ever and in confident earnest." We wish mother and child continued success in post-war Malaya.

Review.

THE ECONOMIC REVIEW OF INDONESIA

Issued by the Department of Economic Affairs, Batavia, Java.

Price 11 guilders per annum post free.

This is a new publication of the Netherlands Indies Department of Economic Affairs, and we have received a copy of the second issue, February 1947. It is published in English. An article entitled "The Industries of the Indies since the Japanese Capitulation" shows clearly the difficulties with which the Dutch have had to contend in restarting industry after a long period of enemy occupation in a country in the throes of political upset. Considerable progress has been made in Batavia where the greater proportion of industry, in territory controlled by the Dutch, is situated. Fortunately Batavia has suffered least from the destruction of buildings and factories. In January 1946 the number of workers in industry was only a few hundred, but by mid-1946 had increased to about 30,000. Measured in terms of equipment, industry in Batavia is estimated to be working at half its pre-war capacity. An interesting article dealing with Java's sugar supply shows how seriously that major industry has suffered from the inability to reorganize and rehabilitate it immediately after the Japanese surrender. Other articles deal with the revival of private enterprise, and explain the regulations governing the movement of goods within Indonesia and between Indonesia and other countries.

This magazine should have a wide circulation in Malaya, providing as it does an up to date picture of conditions in these neighbouring islands.

H. L. B.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

January and February, 1947.

The Weather.

Wet weather eased off slowly during January but light showers were common. Towards the end of the month there was more sunshine and it became hot and dry in many districts. Unusually heavy rains were, however, experienced in Penang and Province Wellesley whereas in Malacca it was well below average. Conditions generally were hot and dry during the first three weeks of February with occasional light to heavy showers later. In Johore, in contrast to normal February weather conditions, this year the rainfall was heavy throughout the State with moderate temperature.

Crop Reports.

Foodcrops and Vegetables.—Good progress was made in Penang in the planting of vegetables and foodcrops on padi land during the off-season, and groundnut seed and lime were distributed free to those cultivators undertaking this form of cultivation for the first time or extending their areas. Maize and vegetable planting on the bunds in the padi fields in Province Wellesley covered an area of about 650 acres at the end of January.

With the termination of the padi harvest in Pahang, renewed interest was shown in the planting of short duration foodcrops, and Malays planted maize, groundnuts and green gram. There was a steady development of areas by Chinese cultivators at Jerantut, Benta, and along the Manchis road, sweet potatoes, soya bean, groundnuts, chillies and vegetables being planted.

The output of fresh vegetables at Cameron Highlands during January continued to be high but prices fell during the middle of February when large quantities were imported into Singapore from Australia and China. The output of vegetables for January is estimated at about 500 tons but there was a very considerable reduction during February.

Fallow season cultivation of vegetables and foodcrops in the padi fields of certain districts of Malacca showed great activity. Cultivators, for the most part Chinese with only a leavening of Malays, were busily engaged in stacking padi straw, digging up and burning stubble, ploughing and planting. Some 466 acres in Central District and 120 acres at Alor Gajah are already planted up with sweet potatoes, tomatoes, chillies, ginger, turmeric, cucumbers, and leaf vegetables. The methods of cultivation are sound, especially the use of padi straw for deep mulchings. Although the extent of fallow season cropping in the padi areas has increased during and since the war, nevertheless some of the Chinese have been farming the same area of padi land for over 30 years.

Wet Padi.—Harvesting was in full swing throughout Kedah during February but from reports received the average is much below expectation. The high price offered by Government for padi has however greatly assisted the cultivators, who are able to obtain a good price for their surplus padi.

In Perak, harvesting was undertaken during February in the earlier planted areas of Krian, and Larut and Matang. In the later planted areas the padi reached the flowering stage. In the mukim of Kuala Kurau, where planting was very uneven, about half the area was in the flowering stage, and about 650 acres were harvested, yields averaging about 320 gantangs per acre. Both stem-borers and rats have caused only very slight damage this season and it is estimated that, in Krian, not more than 100 acres have been damaged and the area of attack is so scattered that the effect on total yield is likely to be negligible. Harvest is late at Sungei Manik, but yields in the older areas are likely to be fairly good. Applications for land in Stage IV are arriving in well.

Harvesting was completed in almost all districts in Pahang. Crops were fairly good in Pahang North, averaging 175 to 200 gantangs per acre; in Pahang South the crop was good, averaging 200 gantangs per acre. In Pahang East about half the padi crop in Pekan and Kuantan Districts was harvested with yields averaging 150 and 100 gantangs per acre in the respective Districts. Chinese cultivators throughout the inland districts have sown nurseries in preparation for planting the off-season crop during March.

In the main coastal area of Selangor harvesting commenced in some of the southern areas during February whereas transplanting was only completed in the north. In inland districts, transplanting was completed on 286 acres at Dusan Tua and Kuala Lui; this is a second crop, the first having been harvested in October-November, 1946. Transplanting of the second crop at Ulu Gombak, in the Kuala Lumpur District, was nearly completed, growth of early fields being promising.

In the Jelebu District of Negri Sembilan, the six ploughing instructors from Malacca completed their work at the end of February, and a number of buffaloes were trained in each mukim. The response to the ploughing campaign has been satisfactory and is gaining momentum. The main difficulty is to purchase ploughs at reasonable prices; nine ploughs were purchased from Malacca at $42 each and these are being loaned out in rotation. An experimental all-metal plough was made locally and if satisfactory could be made in quantity at a price of not less than $20. Arrangements are also in hand with a local engineering firm for the manufacture of mould boards and shares, as the growers can make the wooded framework themselves if they can obtain the metal work at a reasonable price.

Harvesting was either completed or in progress in all districts in Malacca. A few cultivators in all districts are experimenting with two padi crops during the year. Radin Siak 34 and Padi Wangi are the two padi varieties planted.

Rubber.—Wintering was seen in all districts of Province Wellesley but the leaf fall was not so complete as in previous years.

Prices in Kelantan remained steady during January, at $45 per picul for smoked sheet, $38 per picul for unsmoked and $16 per picul for lump and scrap. The interest shown by small-holders in the erection of co-operative smokehouses is unflagging.

In Selangor, wintering was general throughout the State during February with the result that yields were lower than previously and few new areas came into tapping. The co-operative smokehouse at Batang Kali is working satisfactorily and saves members $1 per picul. Capital has already been raised for a similar venture at Kalumpang. A grading scheme has been accepted by dealers in Ulu Selangor who are now paying a premium for good quality sheet.

Coconuts.

The rise in the prices of coconut oil resulted in a heavy demand for copra in Kedah, which increased $3 per picul during February. Relative prices in Kuala Muda, the most important coconut growing district, were $15 per picul of copra during January and $18 per picul in February.

In Perak, seven oil mills were operating during February in and around Ipoh. Oil production is in the region of 5,000 piculs a month with a like amount of copra cake. Prices were 25 to 28 cents per kati for oil and 15 cents per kati for copra cake ex factory.

Poultry.

In Malacca, the output from local hatcheries remained about the same as for the two previous months. The actual out-turn during February was 28,620 ducks and chicks, which sold at 35 to 40 cents each. Goslings said to be imported from Siam rose in price to $4.50 to $5 each. Egg prices remained steady at 15 cents for hen and 12 cents for duck eggs. More attention was paid to poultry keeping, and an unsatisfied demand for laying pullets existed in many kampongs. Duck farming increased in popularity and reports from several such farms, both Malay and Chinese, indicated that a reasonable livelihood might be made from this form of industry.

Miscellaneous.

Demonstrations and Instruction.—Parties of small-holders were conveyed to the Agricultural Station at Bukit Mertajam, and the Padi Test Station at Bukit Merah, Province Wellesley, during January to see the work in progress. In Penang, a party of Malays from Balik Pulau, competitors in the recent Home Garden Competition, were taken to Bayan Lepas to see the winning garden.

In the Ulu Langat District of Selangor seedling rambutan nurseries were planted at ten school gardens in order that budding may be demonstrated later to the pupils.

Early in February, demonstrations were given at Pulau Gadong Padi Experiment Station, Malacca, to Penghulus and selected cultivators, some 144 persons attending. In addition, lectures were given on padi seed selection, fallow season cultivation, and rat destruction methods.

DEPARTMENTAL NOTES

Appointments

Mr. H. L. Barnett, Acting Agricultural Economist, has been appointed to act as Registrar of Statistics, Malayan Union, in addition to his other duties, with effect from 25th July, 1946.

Mr. H. T. Pagden, Senior Entomologist, has been appointed to act as Director of Museums, Malayan Union, in addition to his other duties, with effect from 1st January, 1947.

Mr. J. J. Holmes has been appointed to the post of Assistant to Agricultural Economist with effect from 27th January, 1947.

Mr. G. S. Keeping, B.Sc., Dip. Agr. Sci. (Camb.), has been appointed an Agricultural Officer in the Colonial Agricultural Service. Mr. Keeping has been posted to the Malayan Agricultural Service and arrived in Malaya on 5th February, 1947. He is stationed at Headquarters, Kuala Lumpur.

Transfers.

Mr. E. J. H. Berwick, Agricultural Officer, Perak South, has been transferred to Headquarters, Kuala Lumpur, with effect from 10th March 1947, as Agricultural Liaison Officer, (Food Production).

Leave.

Mr. A. Thompson, Senior Plant Pathologist, returned from leave on 5th February, 1947.

Mr. Gunn Lay Teik, Chemist, returned from leave on 5th February, 1947.

Mr. E. F. Allen, Agricultural Officer, returned from leave on 6th March, 1947. He assumed duty as Agricultural Officer, Perak South, with effect from 10th March, 1947, and will also act temporarily as Agricultural Officer, Cameron Highlands.

Mr. O. M. Lee, Vice-Principal, School of Agriculture, Malaya, has been granted 120 days vacation leave in addition to voyages with effect from 15th February, 1947.

Dr. W. N. Scott, Agricultural Officer, Johore North, has been granted 240 days vacation leave in addition to voyages with effect from 9th March, 1947. Mr. P. V. Ormiston, Agricultural Officer, Johore Central, will take charge of Johore North in addition to his other duties.

Visit to Ceylon.

Mr. H. J. Simpson, Agriculturist, Central Experimental Station, Serdang, visited Ceylon in January, returning in February. The main purpose of the journey was to visit the Tea Research Institute there in order to obtain the latest information in connexion with the cultivation of tea with the object of bringing current practice in Malaya up to date.

Mr. Simpson also took the opportunity of visiting the Department of Agriculture, Ceylon, where matters of mutual interest to both Departments were discussed, with special reference to the mechanized cultivation of dry land crops and wet padi.

Statistical.

MARKET PRICES.

March 1947.

Rubber.—The Singapore price of rubber remained steady at about 42⅛ cents per lb. during January, February and the first half of March. In the second half of March the price advanced from 42⅛ to 44¼ cents per lb. easing to close at 44 cents per lb.

Average prices for London and New York are not available.

The average prices paid for small-holders' rubber at three centres during the first quarter of 1947 are given in Table I.

Table I.

Average Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, January-March, 1947.

(Dollars per picul of 133⅓ lbs.)

Grades	Ipoh, Perak.			Kuala Pilah, Negri Sembilan.			Batu Pahat, Johore.		
	Jan.	Feb.	Mar.	Jan.	Feb.	Mar.	Jan.	Feb.	Mar.
Smoked Sheet ..	50.77	50.55	51.40	49.10	49.50	50.16	48.75	48.55	49.14
Unsmoked Sheet ..	42.70	42.00	42.45	43.25	43.83	44.55	43.30	42.17	42.32
Scrap ..	18.50	17.50	18.12	17.17	18.00	18.66	18.50	19.20	20.66

Transport from Batu Pahat to Singapore by lorry, excluding duty, $1.00 per picul.

Table II.

Singapore Prices of Various Agricultural Products.

Product	March, 1947			February, 1947	Average Price Jan.-Oct. 1941
	Highest	Lowest	Average	Average	
	per picul $	per picul $	per picul $	per picul $	per picul $
Copra:					
Sundried No. 1 ..	21.00	17.50	19.00	17.20	
No. 2 ..	*	*	*	*	2.58
No. 3 ..	*	*	*	*	2.33
Coconut Oil ..	37.00	30.00	34.00	37.20	8.64
Coffee:					
Padang Bali No. 1 ..	142.00	125.00	139.00	115.50	*
No. 2 ..	130.00	100.00	124.00	109.00	*
Palembang No. 1 ..	66.00	62.00	64.00	61.80	18.07-19.91
Sourabaya New No. 1	88.00	84.00	86.00	83.00	19.13-21.02
Bali Old ..	*	*	*	120.00	*
Pepper:					
Muntok White ..	142.00	130.00	137.00	141.00	15.33
Lombong White ..	137.00	120.00	127.00	127.50	*
Sibu White ..	135.00	132.00	134.00	137.60	*
New Black ..	104.00	104.00	104.00	102.30	*
Old ..	*	*	*	*	*
Sarawak ..	134.00	123.00	128.00	*	*
Siam Black ..	116.00	98.00	104.00	*	*
Nutmeg:					
No. 1 ..	*	*	*	110.00	25.19
No. 2 ..	*	*	*	93.00	23.66
Cloves:					
Indian ..	46.00	43.00	44.00	41.00	*
Sumatra ..	56.00	55.00	55.00	54.00	*
Gambier:					
Cube No. 1 ..	100.00	80.00	89.00	90.00	13.65
No. 2 ..	*	*	*	*	*
Cake ..	*	*	*	110.00	*
Sago Flour:					
Lingga ..	16.50	16.25	16.46	17.00	*
Local No. 1 ..	16.00	15.75	15.88	19.50	*
No. 2 ..	*	*	*	16.75	*
Tapioca Flour:					
Malayan No. 1 ..	35.00	29.00	33.50	28.00	*
No. 2 ..	26.00	26.00	26.00	20.00	*
Java ..	38.00	33.00	35.00	36.00	*

* Not quoted.

MALAYAN UNION PRODUCTION OF PALM OIL AND KERNELS.

(In long tons as declared by Estates)

Month 1947	Palm Oil	Palm Kernels
January	2,238.2	292.3
February	2,316.9	337.1
Total ..	4,555.1	629.4
Total May-December, 1946 ..	11,756.4	931.6 (Aug.-Dec.)
Total Jan.-Sept., 1941 ..	38,588.4	2,332.5
Total for the year 1940 ..	57,972.1	9,611.2

Stocks on estates as at 28th February, 1947, were: palm oil 2,047 tons, palm kernels 483 tons.

In February 32 estates (planted acreage 70,004 acres) were in production out of a total of 46 oil palm estates (planted acreage 77,457.9 acres).

MALAYAN AGRICULTURAL EXPORTS, DECEMBER, 1946.

Product	Net Exports in Tons.		
	Year 1940	Jan.-Oct. 1941	October, November and December, 1946
Arecanuts	43,915	24,633	5,424
Coconuts fresh†‡ ..	131,469†	178,404†	3,876†
Coconut oil‡	69,446	65,045	3,997
Copra‡	9,004*	32,682*	13,631*
Copra cake	1,215*	5,659*	1,032*
Gambier, all kinds ..	821	489	90*
Palm kernels	9,219	1,984	—
Palm Oil	56,091	44,406	6,640
Pineapples, canned ..	40,243	15,086	16
Rubber¶	547,202¶§	500,982¶§	153,940¶
Sago,—flour	2,525	1,752*	4,014
„ —pearl	4,848	6,217	20
„ —raw	4,816*	4,400*	1,171*
Tapioca,—flake ..	762	601	8*
„ —flour ..	2,649*	4,310*	6
„ —pearl ..	17,004	15,164	500
Derris	1,258	998	4,556
‡Copra equivalent ..	108,468	138,737	20,204

† hundreds in number. * net imports. ¶ production.

§ Malayan Union and Singapore.

MALAYAN UNION RUBBER STATISTICS.

Estates of 100 Acres and over. Production February, 1947.

In Dry Tons.

STATE	PRODUCTION						STOCKS		PREPARED LATEX PRODUCTION	
	European	Chinese	Indian	Others	Total	Total Jan./Feb. 1947	Beginning of Month	End of Month		
(1)	(2)	(3)	(4)	(5)	(6)	(7)				
Perak ..	4,015	454	237	22	4,728	9,416	3,549	3,813	Preserved field	
Selangor ..	4,349	362	91	5	4,807	9,592	4,219	4,360	Latex	381
N. Sembilan ..	3,250	268	129	113	3,760	7,444	2,462	2,430	Centrifuge	
Pahang ..	1,077	754	123	—	1,954	3,221	836	1,320	Con-	
Malacca ..	1,087	342	71	—	1,500	3,195	1,152	1,026	centrate	849
Penang & P. Wellesley	268	75	3	—	346	772	338	338	Revertex	100
Johore ..	3,951	1,119	189	427	5,686	10,822	3,532	3,999		
Kedah ..	2,818	424	128	24	3,394	7,208	2,954	2,885		
Perlis ..	—	3	20	—	23	47	28	26		
Kelantan ..	275	34	—	22	331	573	259	350		
Trengganu ..	57	44	—	3	104	165	77	108		
Total ..	21,147	3,879	991	616	26,633	52,455	19,406	20,655		1,330

Notes:—1. Figures for production of prepared latex for export are included in the month's production figures, columns 2 to 6.

2. Production by estates of less than 100 acres for February, 1947, was estimated to be 23,370 tons. Total estimated small-holding production January and February, 1947, 50,118 tons.

3. Total latex production 1946, 5,223 tons. Latex production January, 1947, field latex 155 tons, centrifuge 652 tons, revertex 75 tons.

4. Stocks on estates of less than 100 acres are not ascertained.

5. The above forms part of the February rubber statistics published by the Acting Registrar of Statistics, Malayan Union, at Kuala Lumpur, on 21st March, 1947.

MALAYAN UNION RUBBER STATISTICS.

Acreages of Tappable Rubber Actually Tapped and not Tapped on Estates of 100 Acres and over for the Month ending 28th February, 1947.

STATE	Estimated Acreages of Tappable Rubber (9) + (11)	Acreage of tappable Rubber not tapped				Area of tappable rubber never been tapped		Total Area not tapped (3) + (5)		Total Area tapped during the month		Area of tappable rubber rested under rotational systems	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping (a)		(b)		(c)		(c)		(c)	
		Acreage	% of (3) to (2)	Acreage	% of (5) to (2)	Acreage	% of (7) to (2)	Acreage	% of (9) to (2)	Acreage	% of (11) to (2)	Acreage	% of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Perak ..	270,850	2,984	1.1	54,099	20.0	17,149	6.3	57,083	21.1	213,767	78.9	23,737	8.8
Selangor ..	317,543	1,093	.3	64,049	20.2	21,129	6.6	65,142	20.5	252,401	79.5	14,753	4.6
N. Sembilan ..	256,067	3,917	1.5	79,505	31.1	19,990	7.8	83,422	32.6	172,645	67.4	19,180	7.4
Pahang ..	91,135	943	1.0	21,895	24.1	10,230	11.2	22,838	25.1	68,297	74.9	3,494	3.8
Penang & P. Wellesley ..	28,839	586	2.1	4,222	14.6	1,987	6.9	4,808	16.7	24,031	83.3	5,245	18.2
Malacca ..	118,446	3,370	2.8	19,440	16.4	5,461	4.6	22,810	19.2	95,636	80.8	9,591	8.1
Johore (d) ..	421,953	6,896	1.6	125,307	29.7	51,829	12.2	132,203	31.3	289,750	68.7	23,638	5.6
Kedah ..	195,372	894	.4	40,577	20.8	17,488	8.9	41,471	21.2	153,901	78.8	26,615	13.6
Kelantan ..	29,846	215	.7	10,274	34.4	3,063	10.2	10,489	35.1	19,357	64.9	3,142	10.5
Trengganu ..	14,985	448	3.0	7,705	51.4	1,263	8.4	8,153	54.4	6,832	45.6	90	.6
Perlis ..	1,828	—	—	599	32.8	228	12.4	599	32.8	1,229	67.2	127	6.9
Total ..	1,746,864	21,346	1.2	427,672	24.5	149,817	8.6	449,018	25.7	1,297,846	74.3	129,612	7.4

Notes:—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes area on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered estates only.

(e) This table was published by the Acting Registrar of Statistics, Malayan Union, on 26th March, 1947.

MALAYAN UNION RUBBER STATISTICS.

Summary of Stocks, Production, Imports and Exports of Rubber, February, 1947.

In Long Tons, Dry Weight.

		Tons	Tons
STOCKS (31st January)			
Estates	..	19,406	
Dealers	..	68,568	
Ports, awaiting shipment	..	18,709	106,683
IMPORTS	..		7,031
PRODUCTION			
Estates	..	26,633	
Small-holdings (estimated)	..	23,370	50,003
Total	..		163,717

		Tons	Tons
EXPORTS			
Foreign	..	41,087	
Local (to Singapore)	..	18,629	59,716
LOCAL CONSUMPTION	..		102
STOCKS (28th February)			
Estates	..	20,655	
Dealers	..	72,314	
Porst, awaiting shipment	..	10,930	103,899
Total	..		163,717

Note:—The above forms part of the February rubber statistics published by the Acting Registrar of Statistics, Malayan Union, at Kuala Lumpur, on 21st March, 1947.

MALAYAN UNION PADI STATISTICS.

PADI SEASON 1946—1947.

Acreages of Wet Padi harvested monthly and Estimated Yields.

STATE	Total Planted area Acres	Total to 31st January, 1947			February, 1947			Total to 28th February, 1947		
		Area Harvested Acres	Per cent (3) to (2)	Estimated Average Yield per acre	Area Harvested Acres	Per cent (6) to (2)	Estimated Average Yield per acre	Area Harvested Acres	Per cent (9) to (2)	Estimated Average Yield per acre
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Perlis ..	36,640	3,834	10.4	338	13,916	38.0	338	17,750	48.4	338
Kedah ..	236,820	63,413	26.8	212	96,572	40.8	257	159,985	67.6	239
Kelantan ..	132,814	9,220	6.9	121	20,805	15.7	200	30,025	22.6	176
Trengganu ..	34,771	6,728	19.3	161	192	.6	138	6,920	19.9	160
Penang & P. Wellesley ..	36,881	1,637	4.4	231	5,620	15.3	247	7,257	19.8	243
Perak ..	106,491	3,187	3.0	157	17,859	16.8	164	21,046	19.8	163
Selangor ..	34,113	2,728	8.0	237	3,593	10.5	236	6,321	18.5	236
Pahang ..	39,667	32,601	82.1	188	4,174	10.5	169	36,775	92.7	186
Negri Sembilan ..	29,612	26,015	87.3	201	3,491	11.8	161	29,506	99.6	196
Malacca ..	30,611	17,877	58.4	229	9,013	29.4	168	26,890	87.8	209
Johore ..	12,358	6,282	50.3	157	3,392	27.4	90	9,674	78.3	134
Total ..	730,778	173,522	23.7	201	178,627	24.4	235	352,149	48.1	218

Notes:—1. Compiled by the Acting Registrar of Statistics, Malayan Union, from returns received through the Field Branch of the Department of Agriculture.

2. Acreages are amended according to the latest returns received. The latest return is, therefore, the most reliable.

3. There is still a small acreage to be planted in Selangor and Johore.

MALAYAN UNION

PADI SEASON 1946—1947.

Acreages of Dry Padi harvested monthly and Estimated Yields.

STATE	Total Planted area Acres	Total to 31st January, 1947			February, 1947			Total to 28th February, 1947		
		Area Harvested Acres	Per cent (3) to (2)	Estimated Average Yield per acre	Area Harvested Acres	Per cent (6) to (2)	Estimated Average Yield per acre	Area Harvested Acres	Per cent (9) to (2)	Estimated Average Yield per acre
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Perlis ..	60	32	53.3	225	16	26.7	225	48	80.0	225
Kedah ..	4,390	2,958	67.4	60	582	13.3	75	3,540	80.6	62
Kelantan ..	29,863	9,755	32.7	93	18,752	62.8	104	28,507	95.5	100
Trengganu ..	18,182	14,750	81.1	142	2,476	13.6	117	17,226	94.7	138
Penang & P. Wellesley	840	54	6.4	136	30	3.6	138	84	10.0	137
Perak ..	14,120	9,154	64.8	87	4,966	35.2	88	14,120	100.0	88
Selangor ..	4,993	823	16.5	90	3,980	79.7	86	4,803	96.2	87
Pahang ..	3,980	3,247	81.6	92	733	18.4	71	3,980	100.0	88
N. Sembilan ..	40	31	77.5	31	5	12.5	15	36	90.0	29
Malacca ..	130	35	26.9	193	45	34.6	210	80	61.5	201
Johore ..	3,052	1,350	44.2	90	731	24.0	37	2,081	68.2	71
Total ..	79,650	42,189	53.0	107	32,316	40.6	98	74,505	93.5	103

Notes:—1. Compiled by the Acting Registrar of Statistics, Malayan Union, from returns received through the Field Branch of the Department of Agriculture.

2. Acreages are amended according to the latest returns received. The latest return is, therefore, the most reliable.

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1946.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes									Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total		Most in a day. Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	m.m.	ins.								
Ipoh, Perak ..	90.8	72.4	81.6	97	70	83	74			8.41	213.6	1.44	18	17	8					
Port Swettenham, Selangor	88.3	72.3	80.3	93	68	77	75	84.3	84.8	4.86	123.4	1.57	14	10	1	2				
Sitiawan, Perak ..	87.6	73.2	80.4	91	71	81	75			12.31	312.7	2.25	20	17	3					
Kuala Lipis, Pahang ..	85.0	72.2	78.6	92	70	74	74	82.3		7.86	199.6	1.41	23	20	2	29				
Kuantan, Pahang ..	84.1	73.1	78.6	90	71	77	75			28.61	726.7	4.92	26	24	4	1				
Bayan Lepas, Penang ..	87.1	73.8	80.5	90	71	81	75			7.54	191.5	2.13	21	14	4					
Malacca ..	85.2	73.8	79.5	90	71	79	76			9.29	236.0	3.05	20	17						
Mersing, Johore ..	83.0	73.0	78.0	87	70	74	76			27.33	694.2	3.05	27	24	1					
Alor Star, Kedah ..	87.5	72.5	80.0	92	70	77	74			5.33	135.4	2.27	15	12	3	6				
K. Trengganu, Trengganu	82.9	73.3	78.1	88	72	75	77			47.54	1207.5	11.39	21	25		1	1			
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. ..	69.5	61.6	65.5	78	58	63	64	68.8		14.75	374.7	2.25	27	25		21				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	71.0	57.6	64.3	76	53	65	62	68.7		7.11	180.6	1.12	26	22		2				

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, JANUARY, 1947.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes.									Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total.		Most in a day. Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	m.m.	ins.								
Ipoh, Perak ...	93.2	72.0	82.6	98	69	88	75			6.14	156.0	1.22	15	14	5					
Port Swettenham, Selangor	90.3	71.4	80.9	94	68	84	75	84.2	84.6	3.49	88.6	0.70	17	13	4					
Sitiawan, Perak ...	88.5	72.7	80.6	91	69	86	76			6.95	176.5	1.05	23	17	4					
Kuala Lipis, Pahang ...	87.4	72.0	79.7	91	69	79	74	82.5		7.60	193.0	2.03	20	17	1					
Kuantan, Pahang ...	85.8	73.2	79.5	88	71	79	75			19.61	498.1	7.16	21	20						
Bayan Lepas, Penang ..	88.1	74.1	81.1	91	72	85	76			8.10	205.7	1.87	15	13	6					
Malacca ...	87.5	74.2	80.9	90	71	79	76			5.39	136.9	1.11	14	11	3					
Mersing, Johore ...	83.3	74.5	78.9	87	70	75	80			15.41	391.4	3.46	17	16						
Alor Star, Kedah ...	89.6	72.3	80.9	92	70	86	74			3.44	87.4	1.81	12	9	3					
Kuala Trengganu, Trengganu	85.5	73.8	79.7	87	71	82	77			8.31	211.1	1.43	19	16						
HILL STATIONS. Fraser's Hill, Pahang 4268 ft.	69.2	61.3	65.3	74	59	65	63	68.5		7.43	188.7	1.10	22	18						
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.7	57.4	65.1	77	50	69	63	69.1		4.09	103.9	0.74	17	14						

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, FEBRUARY, 1947.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes									Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total		Most in a day. Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	m.m.	ins.								
Ipoh, Perak ..	93.5	71.9	82.7	99	67	79	76			4.58	116.3	1.21	11	11	6	1				
Port Swettenham, Selangor	89.5	72.4	80.9	95	69	84	75	84.9	85.0	10.02	254.5	2.77	18	13	2	1				
Sitiawan, Perak ..	89.0	72.8	80.9	92	71	84	75			6.52	165.6	1.96	18	13	3					
Kuala Lipis, Pahang ..	87.0	71.5	79.3	91	69	75	74	82.9		4.83	122.7	1.16	13	12	7					
Kuantan, Pahang ..	85.3	72.1	78.7	90	69	79	74			19.46	494.3	5.45	17	16						
Bayan Lepas, Penang .	88.5	74.3	81.4	91	72	83	77			2.08	52.8	0.93	7	6						
Malacca ..	87.0	73.6	80 3	92	70	77	75			4.22	107.2	0.87	14	11	2					
Mersing, Johore ..	83.1	73.5	78.3	87	69	74	79			21.93	557.0	4.24	14	14		2				
Alor Star, Kedah ..	91.1	72.0	81.5	95	68	87	75			3.83	97.3	1.90	8	8						
K. Trengganu, Trengganu	84.8	72.1	78.5	89	69	77	76			25.21	640.3	4.91	19	15	2	1	1			
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. ..	70.3	61.1	65.7	75	58	64	63	69.7		6.09	154 7	1.07	18	17		14				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.5	56.4	64.5	77	47	64	62	68.8		3.78	96.0	1.05	13	10		1				

Compiled from Returns supplied by the Meteorological Branch, Malaya.

METEOROLOGICAL SUMMARY, MALAYA, MARCH, 1947.

Locality.	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes								Most in a day.	Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total		Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	m.m.	ins.								
Ipoh, Perak ..	92.5	73.3	82.9	96	69	75				13.17	334.5	2.94	15	15	8	1				
Port Swettenham, Selangor	89.9	73.7	81.8	92	72	85	76	84.9	85.0	13.93	353.8	3.44	20	20	3					
Sitiawan, Perak ..	88.3	74.1	81.2	91	71	82	76			8.81	223.8	1.78	19	17	5	2				
Kuala Lipis, Pahang ..	88.1	72.6	80.3	93	71	77	75	83.7		8.52	216.4	1.16	22	20	4	28	2			
Kuantan, Pahang ..	86.3	73.3	79.8	90	70	77	75			16.86	428.2	3.81	20	18	2	3				
Bayan Lepas, Penang ..	88.1	75.0	81.5	90	72	85	77			7.18	182.4	3.10	18	13	4					
Malacca ..	87.1	74.7	80.9	91	71	81	77			16.20	411.5	5.81	16	13	2					
Mersing, Johore ..	84.7	73.9	79.3	88	71	81	80			8.16	207.3	2.32	17	14	2					
Alor Star, Kedah ..	91.1	73.5	82.3	95	71	87	75			5.43	137.9	2.18	14	12	3	1				
K. Trengganu, Trengganu	86.0	73.5	79.7	89	72	78	76			17.52	445.0	3.18	20	19	1	5				
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. ..	71.5	62.6	67.1	78	61	63	65	70.3		11.44	290.6	1.55	21	18	1	16				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	73.0	58.8	65.9	76	52	66	63	70.2		10.87	276.1	2.02	18	12	1					

Compiled from Returns supplied by the Meteorological Branch, Malaya.